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THE MASSACHUSETTS PNEUMONIA PROGRAM

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THE Massachusetts records of vital statistics for the past eighty years show that pneumonia has been one of the six leading causes of death in every age group from infancy to old age for that entire period. The rate for each decade beginning with 1856-1865 rose from 107.4 per 100,000 to a maximum of 180.7 in 1886-1895, and has since declined to its present level of 96.1. This is but 11 points, or 10.3 per cent, lower than it was eighty years ago, but compared with the highest rate, which was recorded forty years ago, the decline has been 84.4 points, or 51.7 per cent.

Table 1. *Average Annual Death Rates per 100,000 Population of Certain Communicable Diseases in Massachusetts.*

YEARS	PNEUMONIA (ALL FORMS)	TUBERCULOSIS (ALL FORMS)	WHOOPING COUGH	MEASLES	SCARLET FEVER	DIPHTHERIA	TYPHOID FEVER	SMALLPOX
1856-1865	107.4	446.4	23.8	17.1	101.3	86.1	92.5	11.0
1866-1875	132.2	401.2	20.7	15.1	76.6	58.4	80.8	17.3
1876-1885	150.1	378.3	15.1	9.6	53.8	127.2	47.4	1.3
1886-1895	180.7	326.8	12.8	8.7	20.6	73.7	36.9	0.3
1896-1905	174.7	242.9	10.3	7.3	9.9	38.4	21.0	1.6
1906-1915	174.1	170.5	8.2	6.4	6.9	19.4	10.6	0.1
1916-1925	164.8	113.7	9.3	7.8	3.7	15.2	2.9	0.06
1926-1935	99.1	62.8	3.7	3.0	2.4	3.8	0.8	0.002
1936	96.3	43.1	1.2	0.8	1.0	0.6	0.2	0.000
Percentage decline, 1856-1936	10.3	90.3	94.9	95.3	99.0	99.3	99.8	100.0

All the other communicable diseases with which the Massachusetts Department of Public Health has been chiefly concerned, declined from 90 to 100 per cent in the same period of time. Tuberculosis, which had formerly had a rate four times as high as that of pneumonia, declined to less than one half of it. Both these diseases claimed a large percentage of their victims when they were in the prime of life and of the greatest economic value to the community. Public-health authorities made great efforts to control and eradicate tuberculosis, but kept only a tally sheet of the deaths from pneumonia. One of the greatest public-health problems was being neglected. Dr. George H. Bigelow, when commissioner of public health, had the foresight and vision to attempt to solve it or at least do something about it. With the aid of Dr. Benjamin White, director of the Antitoxin and Vaccine Laboratory, he developed a plan that was put into effect in January, 1931, and has been carried out since then with but few modifications.

The Massachusetts pneumonia study had two objectives: the evaluation of pneumonia serum under the conditions of the general practice of medicine, and the development of plans for the distribution of this serum for the treatment of those patients who might reasonably be expected to benefit from its use. It thus embraced problems of scientific research as well as of administrative procedure.

The purposes of the plan may be summarized as follows:

1. To study the epidemiology of lobar pneumonia in the State.
2. To promote more prompt diagnosis of the disease.
3. To encourage and facilitate earlier and more general serum treatment.
4. To study and improve methods for serum production.
5. To correlate the studies on serum production with the results following its clinical use.
6. To devise procedures for the future prevention, serum treatment and control of the disease.

The development of such a program, looking forward to the eventual state-wide distribution of

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pneumonia serum, was recognition of the fact that even though a health department may be unable to prevent the spread of certain infections, it can do much to reduce the resultant loss of life. Long before it was possible to control diphtheria through immunizing procedures, health departments distributed antitoxin, and thereby achieved a decrease in deaths even if not in incidence. If the concentrated pneumonia serum as developed by Felton was capable of reducing the fatality rate for certain types of lobar pneumonia, why should not the State, through its official health agency, make the same services available for this disease, which claims almost two thousand victims each year, as had so long prevailed for diphtheria, which had formerly numbered its victims in the hundreds? Such was the basic guiding thought behind the Massachusetts pneumonia study.

Before any plans for general serum distribution could be considered, it was necessary to show that the serum could be used effectively in home practice and in the small hospitals. This was essentially a problem of field research. These early findings showed that, with proper instructions, the general practitioner could use serum as effectively as could the large metropolitan hospital centers. Such a conclusion was important inasmuch as the number of pneumonia patients who reached these large hospitals early enough to benefit much from serum was but a fraction of the total number of cases in Massachusetts.

During the latter part of the pneumonia study the coincidental development of the Neufeld method of typing pneumococci in the sputum provided rapid and simple laboratory procedures which were within the reach of any laboratory employing adequately trained personnel. Equally important was the elimination of the long delays that formerly attended most type determinations. The introduction of the Neufeld method furnished the key to the problem of controlled serum distribution in that it made it possible to restrict the distribution of serum to those who might reasonably be expected to profit from its use. Such a limitation was essential if so costly a serum was to be distributed at public expense. That the plan so evolved was administratively sound has been well shown by experience extending over the past two years.

Improvements in the methods of serum production were equally essential to the success of the Massachusetts program. These improvements were realized both as a part of and independently of the study, so that the serum as distributed today is a more refined and more effective product than was that generally available in 1931.

The study would have been but a partial success had it merely demonstrated certain administrative principles or elicited certain scientific truths. Its true success must be measured by the extent to which its findings could be applied in practice. It is therefore significant that with the completion of the five years of formal study, financed by the Commonwealth Fund, the Department of Public Health was able to take over as a part of its program the services which had been found to be essential for the continued manufacture and use of pneumonia serum. Thus the distribution of this serum has become as integral a part of the public-health program of the State as is the distribution of other serums or the supervision of the milk and water supplies. The serum is now readily available in all parts of the Commonwealth, and the study has accomplished the ends for which it was designed.

Whatever success may have attended this study was due in large measure to the wise counsel and guidance of the advisory committee on pneumonia, composed of representatives of Boston University, Harvard and Tufts College Medical schools, the medical profession at large, and interested public-health workers, and also to the hearty co-operation of the collaborating clinicians throughout the State. In even larger measure was its success due to the skill and ability of Dr. Roderick Heffron, who has served as field director from the beginning of the study in 1931 up to the present time. I am indebted to him for the statistical material contained in this paper.

The Final Report of the Massachusetts Pneumonia Study and Service, giving in detail the results of the five-year study, has been published,[1] and copies are available on request.

The educational work was carried on with the physicians throughout the Commonwealth through the State, county, and local medical societies. It was realized that the rapid advances in the newer methods of pneumococcus typing and serum production and concentration, with resulting changes in procedures used in the serum treatment of pneumococcus pneumonia, made this necessary, as otherwise the average physician would be unable to co-operate fully or take advantage of the serum offered to him. From the attendance at these meetings it is estimated that 75 per cent of the physicians outside the Boston area were directly reached in this way. Within metropolitan Boston a smaller percentage attended the meetings. All physicians in the State were circularized a number of times, and sent reports as the study progressed.

There has been a steady increase in the demand for pneumococcus typing since the work began. The demand for therapeutic pneumonia serum has likewise increased, and especially so since the latter part of 1935, by which time serum was avail-

able on an equal basis to all physicians in the State.

Early in the study the State was divided into areas, and two or more locally prominent physicians were selected as collaborators in each area. These men were given a few weeks' time to become familiar with recent literature on pneumonia, and were then requested to attend a graduate course on pneumonia arranged through the Harvard Medical School. Laboratory technicians in one or more centrally located hospitals of each area were given a week's training in the State bacteriological laboratory in pneumococcus typing. Concentrated bivalent Type I and Type II antipneumococcic serum was supplied only to the collaborators in the special districts, for use in cases of lobar pneumonia which they might see in consultation or in their own practice.

By 1934 a review of the experience of the State bacteriological laboratory with the then new Neufeld method of typing showed it to be simple, rapid and reliable. The time required for typing was reduced in most instances from many hours to a few minutes. During the study, typing was carried out on nearly ten thousand specimens obtained from patients with lobar pneumonia or bronchopneumonia, and in a few instances from those with other varieties of respiratory disease. If all specimens had come from patients with lobar pneumonia, undoubtedly a larger percentage of Type I and Type II pneumococci would have been found. The six commonest types of pneumococci found in this large group were Types I, III, VIII, II, V and VII, in the order named. These were found in 41 per cent of all specimens examined, or 67 per cent of all specimens containing pneumococci which could be typed.

Table 2. *Six Commonest Types of Pneumococci Found in the Examination of 9737 Specimens from Patients with Respiratory Disease.*

TYPE	NO. OF CASES
I	1485
III	1022
VIII	496
II	378
V	284
VII	238
Total	3903

The fatality rates for cases treated with specific serum in the early part of the Massachusetts study and the results reported elsewhere in this country clearly showed that the maximum benefit of serum treatment was obtained when such treatment was begun within the first four days of illness, and further that the serum then available was useful for treating only Type I and Type II cases. As a consequence, it was decided to broaden the scope of the plan and inform all physicians that under certain conditions they could obtain serum from the laboratory of one of their near-by hospitals where there was a technician who had qualified in pneumococcus typing at the State laboratory. These conditions were:

1. Sputum or other material from the patient shall first be typed and shown to contain Type I or Type II pneumococci.
2. The physician must be willing to certify that his patient has not been ill with pneumonia longer than four days (ninety-six hours).
3. The physician must agree to fill out and return to this department, when his patient is discharged, a brief questionnaire which will be furnished to him with the serum.

Upon meeting these requirements, physicians would receive an average dose of serum, or 60,000 units for Type I cases and 100,000 units for Type II cases.

Table 3. *Fatality Rates of Cases of Pneumococcus Pneumonia Treated with Concentrated Serum within 96 Hours of Onset, and Those Not Given Serum.*

	NO. OF CASES	DEATHS	FATALITY RATE
			%
TYPE I			
Treated with serum*	1,043	145	13.9
Treated without serum†	1,614	403	25.0
TYPE II			
Treated with serum*	281	63	22.4
Treated without serum†	992	407	41.0

*Massachusetts Pneumonia Study cases from January, 1931, to June 30, 1937.

†Cases collected from the American and Canadian literature, 1912 to 1933.

Provision also was made to distribute an additional amount of serum to any patient whose temperature failed to fall below 101°F. by mouth within eighteen hours of beginning treatment; or, if having fallen, it rose above this level within forty-eight hours. The extra amount of serum was also made available for patients having a pneumococcus Type I or Type II bacteriemia, or who were pregnant or had been delivered within the previous seven days.

This plan was at first put into practice in restricted areas and when it was found feasible and acceptable to the physicians the services of the collaborators were discontinued. Since the latter part of 1935 serum has been available to all physicians throughout the State from near-by hospitals.

RESULTS OF SPECIFIC SERUM TREATMENT

In Table 3 are included only those Type I and Type II cases that received the serum treatment within 96 hours of onset and who were given not less than 16 cc. of serum or 20,000 units of antibody.

Early this year we began to distribute serum for Type V cases. The few that have been treated thus far with this product have shown a very favorable response, as shown in Table 4.

The importance of the administration of pneumonia serum early in the course of the disease is shown in Table 5. Our policy until recently has been to distribute serum only for use in patients who had been ill not more than four days. The experience of various investigators, however, has demonstrated quite consistently that although serum treatment is begun later than four days, it may in some instances save lives. In accordance with this evidence we have modified our plan, and while still stressing the importance of early treatment have made serum available for any case of pneumonia of the right type, regardless of the length of time the patient has been ill.

Table 4. *Fatality Rates of Cases of Type V Pneumococcus Pneumonia Receiving Treatment with Concentrated Serum within 96 Hours of Onset and Those Not Given Serum.*

	NO. OF CASES	DEATHS	FATALITY RATE %
Treated with serum*	17	1	5.9
Treated without serum†	337	109	32.4

*Massachusetts Pneumonia Study cases.
†Cases collected from American literature.

Table 5. *Type I Cases Treated with Serum. Number and Percentage of Deaths by Day on Which Serum Treatment Was Begun.*

SERUM TREATMENT BEGUN	NO. OF CASES	DEATHS No.	DEATHS %
1st day	183	26	14.2
2nd day	384	42	10.9
3rd day	294	40	13.6
4th day	182	37	20.3
Totals	1,043	145	
Average			13.9

Of the grand total of 1341 Types I, II and V cases, 326 or 24.3 per cent were treated at home.

SERUM DOSAGE

We recommend the administration of at least 60,000 units for all Type I cases and 100,000 units for those of Type II, and additional doses of from 40,000 to 60,000 units at three- or four-hour intervals for all patients who have bacteriemia, are pregnant or have been delivered within seven days, are forty years of age or over, have involvement of more than one lobe, or whose treatment is begun on the fourth day of the disease or later. Similar extra doses are advised when the temperature does not fall below 101°F. by mouth (102°F. by rectum) within eighteen hours of beginning serum treatment, or when the temperature rises above that level within seventy-two hours after the initial drop.

BACTERIEMIA

Of a grand total of 1341 Type I, II and V cases treated with serum, 635, or 47.4 per cent, had blood cultures done. About 26 per cent of Type I, 29 per cent of Type II and 24 per cent of Type V cases showed positive blood-culture results. As noted in Table 6, the fatality rate for the cases with positive blood cultures was high. The findings in our series suggest that the incidence of positive blood cultures increases with age, a phenomenon which may partially account for the high fatality rate in the older age group.

Table 6. *Type I and Type II Cases with and without Bacteriemia Treated with Serum: Number and Percentage of Deaths.*

BLOOD CULTURES	TYPE I NO. OF CASES	TYPE I DEATHS	TYPE I FATALITY RATE %	TYPE II NO. OF CASES	TYPE II DEATHS	TYPE II FATALITY RATE %
Negative	340	28	8.2	113	17	15.0
Positive	112	32	28.6	47	22	46.8

Table 7 shows that when bacteriemia is present there is more marked proportional increase in the fatality rate in patients 0-49 years old (400 per cent) than in the older patients (200 per cent).

Table 7. *Fatality Rates of Cases of Pneumococcus Pneumonia in Different Age Groups Listed According to the Presence or Absence of Bacteriemia.*

BLOOD CULTURES	0-49 YEARS OF AGE NO. OF CASES	0-49 YEARS OF AGE DEATHS	0-49 YEARS OF AGE FATALITY RATE %	50 YEARS AND OVER NO. OF CASES	50 YEARS AND OVER DEATHS	50 YEARS AND OVER FATALITY RATE %
TYPE I						
Negative	290	17	5.9	49	11	22.4
Positive	85	18	21.2	27	14	51.8
TYPE II						
Negative	87	8	9.2	25	9	36.0
Positive	34	13	38.2	13	9	69.2

PNEUMOCOCCUS TYPING

The demand for pneumococcus typing at the State Bacteriological Laboratory continues to increase, and is more than 25 per cent higher than it was two years ago when the study period ended. Over seventy hospital laboratories now have qualified technicians and are doing their own typing. These laboratories are supplied with diagnostic serums by the department. We estimate that specimens of sputum are sent to some laboratory for typing in about one fourth of all the pneumonia cases in the State.

A review of the typing figures and a careful survey of treated cases clearly indicate the need of a more intensive effort on the part of the physician to have determined the type of pneumococcus infecting the patient whom he is treating. When the first sample of sputum fails to reveal pneumococci, or the findings are questionable, other specimens should be submitted for examination. Further, second specimens should be sent for typ-

ing in every instance where pneumococci other than Types I and II are found in the sputum.

In addition, emphasis must be placed on the great need of taking a blood culture of every patient with pneumonia. The physician must know whether bacteriemia exists, for in the presence of such a condition larger doses of serum are necessary to bring about the desired result, as serum is the only specific treatment known today which will counteract the effects of bacteriemia and sterilize the blood stream.

In the first five years of the pneumonia study, serum was used by about 387 physicians. Since that time, in a period of about eighteen months, the number of physicians using serum has increased to approximately 1100, or about one in six of the total number in the State.

The fatality rate of serum-treated Type I cases has been a little higher since January 1 of this year. Blood-culture studies in the group suggest that possibly the pneumonia was of a more severe form than in previous winters. This may in part explain the increase in mortality. Another factor to be considered is that more physicians are using serum and that many of them have not had the experience necessary to employ it most effectively. Possibly the higher fatality rate of 14 per cent in Type I cases during the past twelve months is a more accurate index of what the general practitioner may be expected to accomplish with serum than was the previous figure of 10 per cent, which was based on treatment of cases by a selected group of physicians who had previously been instructed in serum therapy.

We are now preparing serums for Type VII and Type VIII infections, and these will be ready for distribution in the near future. We shall then have therapeutic serum for five specific types of pneumococci available to physicians without cost to their patients. When physicians as a class become experienced in its use, it is not too optimistic to forecast a reduction of at least one half in the case-fatality rates for this group, which constitutes about 60 per cent of all lobar pneumonias.

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PHYSICAL AND CLINICAL OBSERVATIONS ON THE USE OF MILLION-VOLT X-RAYS

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X-RAY therapy is occupying a place of increasing importance in the treatment of malignant disease. In 1936, there were 3679 x-ray treatments given in one of the large hospitals in Massachusetts, whereas there were only 386 radium applications. During a corresponding period in 1937 the x-ray treatments in this institution increased to 4294 and the radium applications decreased to 290; that is, there was a 17 per cent increase in x-ray work and a 25 per cent decrease in radium work. A large percentage of the radium applications were made in cases of cancer of the skin. These cases could have been more effectively treated with modern x-ray apparatus.

This diminished use of radium is somewhat paradoxical. It has been the observation of most workers in radiation therapy that the shorter, more penetrating rays such as those obtained from radium give the best therapeutic results. This applies particularly to deep-seated neoplasms. In order, however, to deliver an effective amount of radiation to a tumor located near the center of the body, the radiation must not only be composed of short wave lengths but its source must be placed at some distance from the body. Although the gamma rays of radium constitute the shortest wave lengths which have yet become available for cancer therapy, the application of radium at a distance is not practical because of its great cost and scarcity. It has therefore been the endeavor of physicists and engineers to produce, at comparatively moderate cost, x-rays which will approximate in wave lengths the gamma rays of radium and which will be available in quantities equivalent to the output of many hundreds of grams of radium element. Since the shortest wave lengths in an x-ray beam are dependent on the voltage at which the rays are produced, the problem resolves itself into the development, first, of a reliable source of high voltage and, secondly, of an x-ray tube which will operate continuously and reliably at this high voltage. The term "supervoltage" is commonly applied to x-rays which are produced at potentials greater than 200,000 volts.

This problem of supervoltage x-ray generation has been approached by a research group at the

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Massachusetts Institute of Technology from an entirely new angle. Through the generosity of the Godfrey M. Hyams Trust it has been possible to construct a new type of x-ray generator at the Collis P. Huntington Memorial Hospital. This unit has been described in a recent paper by Trump and Van de Graaff,[1] and another article dealing with the mechanical construction and physical characteristics of the rays produced has been written by Dresser, Trump and Van de Graaff.[2] During the first six months of operation 101 patients suffering with malignant disease have been treated, and certain physical investigations have been carried out. There are a number of mechanical advantages in this type of apparatus, and there have been obtained certain gratifying immediate therapeutic results which seem worthy of note.

The machine has been operated routinely at a constant potential of 1,200,000 volts, which we believe is the highest effective voltage ever used for therapeutic x-ray production. The average wave length of the beam approaches that of the rays of radium. The quantity of radiation has been estimated as equivalent to that which would be obtained from 2000 grams of radium element — an amount greater than all the refined radium in the world. The apparatus is mechanically as reliable as any of the low-voltage commercial x-ray units; in fact, during the first six months of operation it has been necessary to postpone treatments for only one day.

Although statistical results of the treatment of various types of malignancies will not be available for several years, we feel that certain pronounced differences which we have already noted between the results of this type of radiation and of the usual 200,000-volt treatment should be reported. The skin will tolerate twice as much x-ray delivered at 1,000,000 volts as it will at 200,000. Moreover, if equal doses of 200,000-volt and 1,000,000-volt x-rays are applied to the skin, about 20 per cent more of the latter will reach the center of the body. The combination of these two factors, that is, the greater skin tolerance and the greater penetrating power, allows the administration of more nearly adequate amounts of radiation to deep-seated tumors without appreciable damage to the superficial tissues. Following treatment with 200,000 volt x-rays many patients suffer from moderate to severe roentgen sickness. This is characterized by general malaise, loss of appetite, nausea and sometimes severe vomiting. There is surprisingly little roentgen sickness following million-volt therapy. This is well illustrated by the following case:

> A patient with extensive cancer of the breast was irradiated at 1,000,000 volts through a large portal including the lateral aspect of the breast and the axilla. The medial portion of the breast was subsequently treated at 200,000 volts through a smaller portal. The dose administered was exactly the same with both types of radiation. The patient suffered no untoward symptoms of any kind following the 1,000,000-volt treatments, but experienced nausea and vomiting after each of the 200,000-volt exposures.

The diminution in roentgen sickness now makes it possible to irradiate many patients as ambulatory cases who otherwise would have to be hospitalized for several weeks.

Unfortunately, there is no yardstick with which to measure our results. Evaluations must be made after frequent and careful observations of the patients irradiated, and mental comparisons made with results obtained during a long experience with low-voltage x-ray therapy. It is our impression that satisfactory results are to be expected only in those tumors which have shown themselves to be in some degree sensitive to low-voltage radiation. The sensitivity of a tumor cannot always be predicted from its histology, and we are therefore obliged to irradiate many seemingly unfavorable cases in the hope that some of them will constitute the exceptions to the rule.

It is exceedingly important to treat with caution those patients who are in poor general condition or who have very extensive malignancies. Much unnecessary suffering may be caused if this rule is not followed. The radiologist soon learns, however, that careful handling of seemingly hopeless cases may occasionally produce surprising results. The first case treated on the 1,000,000-volt unit illustrates this point.

> Having checked the machine as carefully as possible with ionization measuring instruments, a small group of patients was selected for trial dosage. The first patient chosen was one suffering from carcinoma of the larynx. He had been previously treated by radium implantation and by heavy doses of 200,000-volt x-rays. Even though we were dealing with a presumably radiosensitive tumor, the disease was progressing in spite of this therapy, and it was anticipated that the duration of life would not be more than a few weeks. Following repeated small doses of 1,000,000-volt x-rays, designed primarily to determine the skin effect, the patient to our surprise showed improvement. Radiation was then continued in somewhat larger amounts, and today the patient is clinically free of disease.

The antithesis of this case is one of a melanotic sarcoma recurrent after operative removal. It is well known that this type of lesion is exceedingly radioresistant. Although the tumor was heavily treated with 1,000,000-volt x-rays there was, as anticipated, no response.

A brief analysis of the 101 cases that received 824

treatments during the first six months' period seems desirable. They are grouped as follows:

Cancer of the breast	21
Malignancy of the buccal cavity	15
Cancer of the bladder	12
Cancer of the cervix	11
Cancer of the prostate	4
Ovarian carcinoma	5
Cancer of the larynx	3
Renal tumors	2
Cancer of the esophagus	2
Hodgkin's disease	3
Carcinoma of the large bowel	3
Embryoma of the testicle	2
Miscellaneous	18

The irradiated breast cases have been either in the inoperable group or in that group showing recurrence after operation. Regression of local disease has been as prompt as one would expect after 200,000-volt therapy, but there have been less skin reaction and less roentgen sickness. In a case which was given an unusually large dose, a reaction which might be attributed to damage from radiation was noted in the lung. This patient, however, developed bone metastases, and it is not improbable that these changes were due to metastatic disease rather than to radiation pneumonitis.

There are certain advantages in treating carcinoma of the mouth and throat at very high voltage. Coutard[3] has shown that in order to control malignancies in this region with 200,000-volt therapy, doses must be administered which actually destroy the outer layer of the skin and occasionally result in rather painful, slowly healing ulcerations. At higher voltage the same effective dose may be delivered to the tumor, but with no further skin effect than a mild, scarcely noticeable erythema. If indicated, the radiation may be repeated after an interval of several months, which is not possible following an adequate dose of 200,000-volt x-ray.

The group of bladder tumors has proved most interesting. In a recent review by Graves and Dresser[4] of a series of cases of carcinoma of the bladder treated at 200,000 volts, it was found that little more than a moderate degree of palliation was afforded. The immediate results, however, from 1,000,000-volt therapy have been much more encouraging. All these cases have been hopeless from a surgical point of view or have shown recurrence after operation. In almost every instance there has been either partial or total regression of the tumor with symptomatic relief. With one exception there was no untoward general or local reaction.

Most of the cases of carcinoma of the cervix uteri have been previously irradiated either with low-voltage x-ray or radium. They have, therefore, constituted a very unfavorable group. A recent review by Meigs and Dresser[5] of three-year results obtained at the Pondville Hospital by combined 200,000-volt x-ray and radium treatment has proved beyond doubt the value of this method. It is anticipated that a combination of x-ray and radium, using 1,000,000-volt rays instead of 200,000-volt, may lead to even more gratifying results.

Much palliation has been afforded in all the cases with carcinoma of the prostate, but in no instance has there been complete disappearance of the neoplasm.

One case of carcinoma of the esophagus is now entirely symptom-free, presents a normal esophagus by x-ray examination, and is gaining weight. A second case has had no relief from obstruction and the patient has just been submitted to a gastrostomy. He has recovered satisfactorily from the operation, and further intensive radiation to the esophageal growth is planned.

It is the intent to irradiate reasonably large groups of cases with malignancies of various types so that statistical data as to the success or failure of this treatment will ultimately be available. Our observations thus far lead us to believe that in the treatment of deep-seated neoplasms the immediate results of 1,000,000-volt x-ray therapy, even though they may prove to be only palliative, are superior to those obtained with lower voltages. The regression or complete disappearance of new growths takes place with little or no untoward general reaction on the part of the patient, and apparently with less damage to normal tissues than has heretofore been observed.

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INTESTINAL TUBERCULOSIS

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INTESTINAL tuberculosis occurs in the great majority of cases as a complication of advanced pulmonary disease. Treatment of the intestinal lesion in these cases is obviously of little avail as regards ultimate prognosis, although with modern methods improvement of the enteric disease is a not uncommon observation.

In the cases of intestinal tuberculosis without active disease elsewhere, the results of treatment are more favorable, but the mortality still remains high. One writer[1] has stated that our treatment of intestinal tuberculosis today is comparable to the treatment of pulmonary tuberculosis of ten years ago.

Routine gastrointestinal x-ray examinations in tuberculosis sanatoriums show that the number of cases with intestinal ulceration varies from 17 per cent (Veterans' Hospital, Sunmount, New York,[2]) to 38 per cent (Metropolitan Hospital, New York City[3]). Brown and Sampson[4] at Saranac Lake made a clinical and x-ray diagnosis of ulcerative enteritis in 26.4 per cent of 5542 patients with pulmonary disease. They have checked a series of these cases at operation and autopsy and have found their diagnosis correct in over 90 per cent.

A still higher incidence of intestinal ulceration is found at autopsy in cases of fatal pulmonary tuberculosis: Brown and Sampson[4] 60 to 90 per cent; Granet[3] 72 per cent; Kaufman[5] 90 per cent. Intestinal tuberculosis not only ranks the highest as a complication of pulmonary disease, but also increases the problem of treatment on account of the difficulty in maintaining nutrition. In many pulmonary cases the inception of intestinal symptoms is coincident with a downward course with fatal termination.

In our tuberculosis sanatoriums in Massachusetts, funds for routine gastrointestinal studies of pulmonary cases are not available. Statistics† from ten of these hospitals showing the incidence of tuberculous enteritis in pulmonary cases as compared with institutions where routine gastrointestinal studies are made are of interest. Of 6401 cases with pulmonary tuberculosis treated, a clinical diagnosis of intestinal tuberculosis was made in 391 or 6.1 per cent. In two sanatoriums‡ in Maine 538 pulmonary cases were treated in 1935-1936; 76 or 14 per cent were diagnosed as intestinal tuberculosis. Statistics[6] for Connecticut show 2007 cases of pulmonary tuberculosis treated from 1934 to 1936, in none of which was a diagnosis of intestinal tuberculosis made. At the Massachusetts General Hospital[7] since 1900 there have been 195 cases diagnosed as intestinal tuberculosis, 9 with tuberculous appendicitis, 52 with rectal tuberculosis and 24 with tuberculosis of the anus.

At the Lakeville Sanatorium, which is devoted exclusively to extrapulmonary tuberculosis, we have treated 39 patients with intestinal tuberculosis. This small number is explained by the fact that we admit no patient with active pulmonary disease. During the same interval we have treated 82 patients with tuberculous mesenteric glands and 133 cases of tuberculous peritonitis.

State and federal statistics regarding the incidence of intestinal tuberculosis are not available, since tuberculous peritonitis, mesenteric lymph nodes and intestinal tuberculosis are grouped together. In these three groups there were 2501 deaths from 1912 to 1[illegible] inclusive in Massachusetts.[8] The highest number, 202, occurred in 1916; the lowest, 31, in 1934. In the United States[8] there was a yearly average of 2200 deaths from these three diseases from 1930 to 1932, inclusive, which dropped to 1431 in 1935.

These statistics are subject to many errors, and obviously are not based upon intestinal tuberculosis seen as a complication of pulmonary disease. They are, however, decidedly hopeful.

The hyperplastic type of intestinal tuberculosis, characterized by a marked thickening or hyperplasia of the intestinal wall, occurs much less frequently than the ulcerative, since it is seldom found as a complication of pulmonary disease. Lockhart-Mummery[9] reported 100 cases of this type, in 76 of which no other tuberculous lesion was found. By many writers it is described as a primary tuberculous lesion. This statement has been questioned, since 50 per cent of children have bovine tuberculous foci and about 90 per cent of adults have tuberculous infections during their lives. An intestinal lesion may have its origin in an arrested focus in the lungs, the lymph nodes or elsewhere in the body.

The route of transmission of tubercle bacilli to the initial lesion in the intestine is still unsettled. In the presence of positive sputum or of bacilli in the stools or breast milk, the evidence for inges-

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†Plymouth County, Westfield, Belmont, Rutland, Essex, Bristol, North Reading, Norfolk, Worcester and Springfield Health Department hospitals and sanatoriums.

‡Western Maine and Central Maine sanatoriums.

tion is quite conclusive. Many cases with active pulmonary disease are observed which have positive stools with no intestinal lesion, and many others with tuberculous mesenteric lymph nodes or tuberculous peritonitis and no lesions in the intestine. This simply substantiates the general belief that in many cases the intestine is immune to tubercle bacilli in the stools. The fact that 34 per cent of the cases of intestinal tuberculosis occurring in the British Isles, where much of the milk is tuberculous, are primary lesions favors the ingestion theory.

There is considerable evidence that the tubercle bacilli are carried by the blood stream in many cases of enteritis, from a ruptured cavity in the lungs or from lymph nodes, as stated by Archibald,[10] Calmette[11] and others. Cases with negative sputum and stools at least are very suggestive of transmission by the blood stream.

The initial lesion in the intestine in from 80 to 90 per cent of patients is in the terminal ileum and cecum (Brown and Sampson,[4] Granet,[3] Archibald[10]). The susceptibility of this region to the tubercle bacilli is thought to be due to the increased blood supply, the greater number of Peyer's patches and solitary follicles, and stasis of the fecal stream.

The ulcerative type of lesion in most cases extends upward in the ileum from the original focus, forming circular or girdle ulcers of the mucosa or, less frequently, longitudinal or multiple small ulcers. The edges of the ulcers are ragged and the floor is covered with tubercles. The wall of the intestine over the ulcer is often thickened, and the peritoneum is congested and covered with exudate and tubercles. Adherence of loops of intestine at the site of ulcers is common; penetration of ulcers through the muscular layers occurs, although not commonly. Perforation is a rare complication on account of adhesions at the ulcer site. Abscesses and fistulas are not uncommon. As the ulcers heal, obstruction of varying grades may occur, due to angulations and narrowing of the lumen resulting from adhesions or fibrosis of a girdle ulcer with stricture.

The hyperplastic type of disease develops in practically all cases in the ileocecal region, but in a small percentage it extends to other sites in the large intestine or in the rectum and anus. It is rarely if ever found in the hepatic or splenic flexures. Hyperplastic and ulcerative types of lesions may occur simultaneously in the same patient. Hyperplastic lesions are characterized by formation of a tumor, often of considerable size, resulting from the production of granulation tissue in the submucous and to a lesser degree in the subserous coats of the intestine. Ulceration of the mucosa may occur; more frequently the increased thickness of the intestinal wall causes a narrowing of the lumen, resulting in obstruction. The adjacent lymph nodes are enlarged, increasing the size of the tumor and giving the gross appearance of carcinoma.

Intestinal tuberculosis in most cases has an insidious onset. Patients with pulmonary disease have a loss of appetite, mild indigestion, constipation or diarrhea, loss of weight, an unexplained slight fever, and abdominal pain which may be generalized but is more frequent in the right lower quadrant. The pulmonary lesion remains at a standstill or shows evidence of activation. Gastrointestinal x-ray studies at this stage are frequently inconclusive.

As the disease progresses, nausea and vomiting occur; abdominal pain more definitely located in the right lower quadrant and aggravated by eating, diarrhea, — often of a severe type, — distention and more marked loss of weight are observed.

In the hyperplastic type, — abdominal pain is more definitely located in the right lower quadrant in the early course of the disease. Later a tumor is palpable in this region, often with symptoms of obstruction. Many of these patients are subjected to abdominal exploration, when the correct diagnosis is established and an unoffending appendix is removed.

X-ray diagnosis in these cases is based upon the so-called Stierlin phenomenon, or a filling defect and hyperirritability of the cecum. A persistent irregularity and spasm of the ileocecal valve is also observed. In many cases there is a marked narrowing of the terminal ileum. The ulcerative type of disease is characterized by a segmentation and dilatation of distal loops, giving the appearance of a string of sausages.

The diseases most commonly considered in a differential diagnosis are cancer, regional ileitis, ulcerative colitis and nonspecific granuloma. In cancer the patients are usually older, blood in the stools is commoner, and emaciation and anemia are more pronounced than in intestinal tuberculosis. The symptoms of regional ileitis in its early course are suggestive of an acute inflammatory lesion or may simulate ulcerative colitis; obstruction, perforation, abscess and fistulas are later manifestations. Intractable diarrhea, characteristic stools and prostration help to distinguish ulcerative colitis. Nonspecific granuloma is frequently mistaken for hyperplastic tuberculosis, clinically and in x-ray studies. The gross specimen and microscopic section closely resemble those of tuberculosis. Wilensky and Moschowitz[12] state that many cases of nonspecific granuloma have been incorrectly diagnosed as tuberculosis by pathologists.

In the past fifteen years the results of the use of heliotherapy and ultraviolet rays in the treat-

ment of intestinal tuberculosis have been comparable to those of surgery in pulmonary tuberculosis. The greatest field of usefulness for light therapy is in the ulcerative cases, which prior to its introduction were considered almost hopeless. Brown and Sampson,[4] have advocated its use even in the presence of advanced pulmonary disease. They have observed healing of intestinal lesions in the presence of progressive and even fatal pulmonary disease. In their series of 271 patients treated with ultraviolet rays they reported good results in 73 per cent. Our small series of cases at Lakeville Sanatorium are in most instances of the hyperplastic type of disease, and do not occur as a complication of active pulmonary disease. Our results with ultraviolet rays in these cases have been highly gratifying, although we do not use the intensive treatment advocated by Brown and Sampson.

Granet[8] has shown that many cases of intestinal tuberculosis have a positive sputum and that few have a negative sputum. He advocates collapse therapy in the former if possible, in order to produce a negative sputum before the use of light therapy for the intestinal lesion.

Pneumoperitoneum has been of great benefit in the treatment of tuberculous peritonitis, and has been advocated for intestinal tuberculosis. Salkin,[1] of the Michigan State Sanatorium, has reported benefit in a high percentage of ulcerative cases. We believe, however, that this form of treatment is still in the experimental stage.

The field of surgery in intestinal tuberculosis is limited at present to the relief of intestinal obstruction, removal of the rare tuberculous appendix, an exclusion operation, or in selected cases resection of hyperplastic disease, and treatment of perforations, abscesses and fistulas.

Intestinal obstruction is a not infrequent occurrence in both the ulcerative and hyperplastic forms of intestinal tuberculosis. The treatment does not differ from that of obstruction from other causes, except that resection of the diseased intestine, if necessary, should be done at a later time.

Santy[13] has reported a series of 20 cases of hyperplastic disease without obstruction in which a primary resection was done in 10 and an exclusion operation in the others. Light therapy was used in the cases treated by exclusion with much better results than in those treated by resection. Excision of the diseased segment was done at a later date if the disease was not completely arrested by light therapy. An operation which provides exclusion and anastomosis, with colostomy in certain cases, puts the diseased segment of the bowel at rest. With the addition of light therapy this appears at present to be the best method of healing the tuberculous process. In a certain number of patients healing of the disease with a functionless segment of bowel results. If an excision is necessary on account of incomplete healing, the operation is much less formidable than if done at first. The diseased bowel is usually found to be a fibrous cord of scar tissue. Nearly twenty years ago Archibald advised a bilateral colostomy in patients with tuberculous enteritis whose condition contraindicated resection.

A few cases of tuberculosis limited to the appendix have been reported. If the appendix is removed before contiguous organs are involved, a cure may be expected. Unfortunately, in most of these cases the tuberculous process is found at operation to have involved the terminal ileum and cecum. Cases of advanced inoperable ileocecal tuberculosis with severe pain may be greatly relieved by removal of a tuberculous appendix.

Perforation is a rare complication of intestinal tuberculosis, with a high mortality. Brown and Sampson,[4] also Bérard and Patel,[14] stated that it is found at autopsy in 3 per cent of patients who succumb to pulmonary disease. It occurs most frequently in the terminal stages. A clinical diagnosis is rarely made, and in most cases the patient's condition precludes operation. Ameuille and Duperrat[15] reported 12 cases observed in four years, and cited from the literature 4 cases of recovery following operation. All these recoveries occurred in patients with minimal or no pulmonary lesions. Marconi[16] published 21 cases of perforation collected in the literature, 5 of which recovered following operation and 16 of which died. He cited 1 case of his own which recovered following operation.

The more characteristic manifestations of intestinal tuberculosis are illustrated by a brief review of some of the cases in my private practice and at the Lakeville Sanatorium:

CASE REPORTS

Case 1. Mrs. A., aged 40, was admitted to the Moore Hospital on December 11, 1917. She had had active pulmonary tuberculosis and had been treated in a sanatorium. She was 6 months pregnant at the time of onset of acute symptoms. Increasing constipation for six weeks was followed by obstruction for 5 days before admission. At operation, loops of terminal ileum were adherent and an enterostomy was done proximal to the obstruction. Miscarriage ensued 12 hours later. Two and a half months later the diseased ileum was resected and an anastomosis was done. The patient's condition in May, 1937, was excellent.

Case 2. Mr. S., aged 30, who was admitted to the Moore Hospital on July 20, 1922, gave a history of general abdominal pain, indigestion, attacks of severe constipation and of vomiting, and loss of weight for the past 5 years. He had had no bowel movement for 3 days prior to intervention, and there were the usual signs of obstruction. No

signs of pulmonary disease were found. An enterostomy was done without benefit, and death ensued the following day. At postmortem, hyperplastic ileocecal disease and complete transposition of viscera were found.

Case 3. Mr. McQ., aged 46, was admitted to the Moore Hospital on March 5, 1925. He had had general abdominal pain, indigestion without relief by food, and frequent attacks of severe pain in the right lower quadrant for 5 years. Hyperplastic ileocecal disease and numerous annular strictures of the lower ileum were found at operation. An ileostomy resulted in temporary relief. He was sent to a sanatorium, where he died in 1927.

Case 4. F. C., a 28-year-old woman, was admitted to the Lakeville Sanatorium on January 14, 1937. In August, 1933, an appendectomy had been done in the Salem Hospital, and was followed by a fecal fistula. In December, 1933, the fistulous opening was closed, but it promptly reopened. She was sent to the Massachusetts General Hospital, and in July, 1936, a transverse colostomy and repair of the fecal fistula in the rectosigmoid was done. The fecal fistula again reopened and a urinary fistula developed, both of which still persist. Guinea-pig inoculation at Lakeville gave a positive reaction. She now has a large, firm tumor in the right lower quadrant, extending into the pelvis and apparently involving the bladder. Her general physical condition is steadily improving under the usual treatment with ultraviolet light despite the extensive local disease.

Case 5. L. R., a 21-year-old colored man, was admitted to the Lakeville Sanatorium in April, 1936, for tuberculosis of the 9th, 10th, and 11th dorsal vertebrae. Gastrointestinal x-rays were taken at another hospital before admission, with a report of almost complete obstruction of the ileum from an old appendix abscess or tuberculous peritonitis. In June, 1936, a fusion operation of the spine was done by Dr. Z. B. Adams. Abdominal symptoms persisted, characterized by pain in the right lower quadrant and a gradually increasing tumor in this region, and in October, 1936, he was referred to me for marked signs of obstruction. He was relieved of his obstruction by conservative treatment, and at operation a resection of the terminal ileum and cecum and a lateral anastomosis were done. A very stormy convalescence followed, complicated by a fecal fistula which required closure. The patient is now free from abdominal signs of disease but has bilateral renal disease.

SUMMARY

1. Ulcerative enteritis is found postmortem in from 65 to 90 per cent of patients with fatal pulmonary tuberculosis. The hyperplastic type of intestinal tuberculosis occurs much less frequently, and in many patients no active disease is manifested elsewhere in the body.

2. There is considerable evidence that tubercle bacilli are transmitted by the blood stream. It appears that in the great majority of cases of intestinal tuberculosis the organisms are ingested and transmitted by the digestive tract.

3. The initial lesion in over eighty-five per cent of cases is in the Peyer's patches and solitary follicles in the terminal ileum and cecum. The process may spread upward in the ileum, characterized by ulceration. It may remain at the site of origin or extend distally in the form of hyperplastic disease or in combination with ulcerations.

4. The early symptoms are insidious and are characterized by digestive disturbances and pain in the right lower quadrant. The later stages are marked by severe gastroenteritis, and in many cases, the symptoms are suggestive of an "acute abdomen." Abdominal emergencies are the result of acute obstruction, tuberculous appendicitis, perforation and abscess.

5. The most effective treatment for the ulcerative type of lesions consists in suitable therapy of pulmonary disease so as to obtain a negative sputum and stop the flow of tubercle bacilli in the intestinal tract, ultraviolet-light treatment, and proper hygiene and diet. Hyperplastic disease is best treated in most cases by some type of exclusion operation, followed by ultraviolet radiation and later excision, if necessary. Primary resection should be reserved for the rare patient who is an excellent risk. Obstruction, appendicitis and perforation do not differ in their immediate surgical indications from similar conditions resulting from diseases other than tuberculosis.

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Discussion

Dr. James W. Jameson, Concord, New Hampshire: Dr. Moore's paper brings up a condition that is likely to be overlooked by the general surgeon unless he is connected with a tuberculosis sanatorium, because he is apt to associate intestinal tuberculosis with the advanced cases where there is extensive ulceration, intestinal obstruction, abscesses and fistulas or the hyperplastic form of tuberculosis. The diagnosis in these cases is relatively easy.

It is in the early stage of the disease that diagnosis is difficult, but when we realize that over 95 per cent of the cases with intestinal lesions have a positive sputum, we must not fail to consider an intestinal involvement in any tuberculous patient with abdominal symptoms. As only

a small proportion of tuberculous patients are treated in sanatoriums, one must keep intestinal tuberculosis constantly in mind, although the surgeon is less apt to see these cases than the internist.

My experience with intestinal tuberculosis has been limited to cases with tuberculous fistulas and to 1 case of the hyperplastic type, the results in both conditions being very unsatisfactory. The case of hyperplastic tuberculosis was that of a girl of nineteen with an active pulmonary lesion. I did a resection of the terminal ileum, cecum and ascending colon with end-to-end anastomosis of the ileum to the transverse colon. She lived about six months, and died from pulmonary hemorrhage without evidence of extension of the intestinal lesion.

DR. MOORE (closing): I am going to show a few x-rays to illustrate the filling defects of the terminal ileum but more especially those of the cecum, the so-called Stierlin defect, which is considered characteristic of tuberculosis.

In regard to treatment, I should like to emphasize again that heliotherapy and ultraviolet radiation in the ulcerative type of disease have proved to be of great benefit. In hyperplastic intestinal tuberculosis, heliotherapy and ultraviolet radiation have not been used so extensively because this form of the disease is less frequently observed, and also because it is not commonly seen in sanatoriums. In conjunction with some type of exclusion operation the results have been decidedly encouraging as compared with excision of the diseased segment of intestine alone.

THE SURGICAL TREATMENT OF PAIN

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THE presentations which have preceded my attempt to discuss the surgical treatment of pain have made it clear that there are two types of pain arising through separate mechanisms. There is somatic pain, arising in relation to changes in the central nervous system, and there is visceral and vascular pain, apparently having to do with changes in the autonomic nervous system. Somatic pain follows topographic anatomy, repeats itself in the same area, does not radiate with recurrent attacks into new fields, returns each time with more or less the same intensity and is usually discontinuous in action. Patients suffering from trifacial neuralgia (tic douloureux) are an example of somatic, central-nervous-system pain. Autonomic or sympathetic pain is fickle and capricious; it occurs in a less limited field, which it frequently overflows, it varies greatly in intensity with different attacks, is aggravated by the emotions and by barometric pressure, and it bears a more distinct relation to the individuality of the patient. Patients suffering with traumatic causalgia represent this type of pain.

Pain is the symptom that brings most patients to the doctor. Fortunately its cause can usually be determined and proper therapy for its relief instituted. Such an indirect attack on pain as the removal of biliary or urinary calculi which gave rise to it need not interest us here. We have only time to discuss a few examples of the surgical treatment of pain where the treatment is directed at the nervous system itself. The surgeon must always bear in mind this rule: before any operation is undertaken that has for its primary object the denervation of a painful part, he must prove to himself that a direct attack on the lesion is impossible. Such conditions are met with when the painful area is more extensive than the local lesion, as in widespread local extension of cervical cancer, or with bony metastases, and when there is referred or visceral pain and the real lesion is either difficult of access or incompletely understood, as in angina pectoris and dysmenorrhea.

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SOMATIC PAIN

A direct attack on the central nervous system may be aimed at the peripheral nerve, the posterior nerve roots or the anterolateral tracts of the spinal cord, where the pain fibers are gathered together; transection of the spinal cord has even been performed (Cushing and Leriche). These procedures have been carried out largely as merciful procedures in patients suffering from hopeless cancer or from injury to the spinal cord.

In dealing with pain in carcinoma of the face and mouth, the contributions of Grant, Mixter, Adson and Fay describe the considerable relief that can be given by alcoholic injections of the second and third divisions of the fifth nerve, by intracranial division of the fifth and ninth nerves, or by intradural division of the posterior nerve roots of the upper three cervical nerves. Such procedures may be of great help to patients, particularly when slow-growing, non-metastasizing tumors are the source of the pain.

The more usual application of this form of surgery is seen with malignant disease in the pelvis, which is inoperable, radioresistant or metastatic to the spine. Section of the posterior nerve roots was first proposed for this dilemma by

Dana in 1886, and the first successful American case was reported by Abbe in the *Boston Medical and Surgical Journal* in 1896. This operation, known as rhizotomy, has long since fallen into disrepute because of the great overlapping of the sensory nerve supply. It was found necessary to cut at least three roots above a lesion, and if the disease was widespread the ordeal proved too great for most of these already debilitated patients.

Moreover, by 1911 Spiller and Martin had published their first case of chordotomy. This operation depends for its success on the fact that pain and temperature fibers after entering the cord cross over and pass up the cord in the anterolateral region. Our knowledge of this pathway begins with a suggestion by Gowers in 1879, which was more emphatically stated by Van Gehuchten in 1893; but it was Spiller's brilliant clinical proof in a patient that led in 1904 to his endorsing the procedure. The operation is quite simple and may be performed under local anesthesia, since dividing the pathway in the cord is not painful. The dura is opened, the arachnoid is incised, a dentate ligament is separated from the dura near the desired root, its dural end is seized in a clamp, and by pulling on this the cord is rotated until the ventral root is clearly seen. A cataract knife or the special hook and knife devised by Frazier are then used to divide the anterolateral bundle. The incision should start at the dentate ligament, enter to a depth of 2.5 to 3 mm., and emerge at the ventral root. A considerable number of such procedures have been done, Grant alone reporting 51 in 1930. The operation has its opponents and proponents. Stookey has shown relief with only a 1.5-mm. incision, which he thought preserved the more deeply situated temperature fibers, but Foerster holds that in a unilateral procedure the incision must be very deep and must enter the gray matter if pain is to be obviated. Davis believes that the deeper incision into the gray matter is more apt to obviate pain, since it also divides certain sympathetic fibers there, which he thinks are the source of the pain in unsuccessful cases. The operation should be carried out from four to five segments above the uppermost involved lesion. It is more successful if bilateral, in which case different levels should be used on the two sides. It may be done in the lower cervical region, but is usually performed for lower spine or pelvic lesions, in which the upper thoracic level is simplest and safest. There are obvious dangers: hemorrhage may cause serious motor weakness; from 10 to 20 per cent of patients have bladder difficulty, which may be very bothersome; and in debilitated patients with a prospect of short life, the risk may not be worth while. For traumatic lesions of the spine, however, and other benign conditions it is eminently desirable. More recently (1934) Dr. Tracy Putnam suggested division of the spinal commissure when the painful disorder was confined to the thorax and arm. Chordotomy for this area, placing the operation high in the cervical spine, is too dangerous, and rhizotomy of the upper cervical nerve renders the arms practically useless. Dr. Putnam has invented a small myelotome which can be inserted in the dorsal fissure and thus used to divide the fibers at the decussation. One can only say that the objections to the procedure would be its magnitude in patients obviously very ill.

Lastly, to combat this painful spinal condition, again usually due to metastatic carcinoma, we have relief by the subarachnoid injection of alcohol. This was introduced by Dogliotti in 1931, and is so simple and safe that in my opinion it will largely supplant the surgical procedures already outlined for extensive malignant disease in the pelvis. The considerations are simply that alcohol is lighter than cerebrospinal fluid and will therefore float upon it. The patient is placed on his normal side, and so angulated that the uppermost part of the cord contains the spinal roots by which painful stimuli enter the cord. By slightly tipping the patient ventrally, the motor root is further protected. From 1 to 2 cc. of alcohol is then slowly injected, after withdrawing a corresponding amount of cerebrospinal fluid. Dogliotti used absolute ethyl alcohol, but following the suggestion of Dr. Tracy Putnam we have used a mixture of 60 per cent absolute ethyl alcohol and 40 per cent absolute methyl alcohol in most of our cases. The manner of action of the alcohol is unknown. Dogliotti believed that it destroyed certain fibers in the dorsal root. Perhaps like other anesthetic agents, it affects sensory nerves more than it does motor nerves. Our cases have been chiefly those with carcinoma of the cervix, bladder or prostate, causing pain from local pressure in the pelvis. Until more is known about how the alcohol acts, such a procedure should be confined to the relief of intractable pain in patients with advanced cancer. In our hands, 50 per cent of the cases have had highly successful results. Where incomplete relief was obtained the areas of anesthesia did not coincide with the areas of pain. This serves to emphasize the great importance of the position of the patient and the selection of the site for injection. For obvious reasons, alcohol is not so effective for the treatment of spinal metastases, and will possibly be reserved for intractable pain where the pain fibers enter over a small field. Thus chordotomy will still hold its place as a merciful pro-

cedure in certain cases of widespread spinal involvement.

VISCERAL PAIN

Those who walk in this field still tread a mysterious pathway, and it may be well to restate certain accepted principles.

1. The internal viscera are sparsely supplied with sensory neurons.

2. The internal viscera are liberally supplied with fibers from the sympathetic or parasympathetic systems.

3. The internal viscera are relatively insensitive.

4. We must conceive as an *adequate stimulus* new factors, quite different from those we commonly consider as giving rise to pain. This point requires elaboration, since progress will be difficult unless the new concept is clear to us. Thus, the internal viscera are as a rule insensitive to cutting and burning but are sensitive to changes in tension. This should have been suspected earlier on teleologic grounds alone, since an internal viscus would not be exposed to cutting or burning but would constantly undergo a shifting tension. But this doctrine of an adequate stimulus is not in itself final for visceral pain as related to special nerve fibers, for we see examples of pain from the stimulus of highly specialized nerves, such as pain in the eye from sudden exposure to intense light.

5. The sympathetic nervous system has both afferent and efferent pathways. The afferent fibers appear to pass from the viscera to the cord straight through the paravertebral ganglia without synaptic connections, entering the cord by the white rami of the spinal nerves and terminating in its gray matter. Efferent neurons in the spinal cord emerge with the ventral root and pass by way of the white rami to the sympathetic ganglia. Thus the white ramus constitutes the sole motor connection between the spinal cord and the sympathetic trunk.

6. Certain experiments, notably those of Davis and of Weiss and Davis, indicate that the somatic sensory apparatus must be intact for the perception of pain, even if we are satisfied that the original impulse travels by way of the sympathetic system. The pain of such an impulse, according to Davis, travels up an afferent pathway to the cells in the gray matter, along an afferent pathway to the paravertebral sympathetic ganglion, and from this synapse outward to the periphery, where a change occurs that stimulates the peripheral sensory nerve ending; from it the impulse passes back to the cord and upward to the cerebral centers, where pain is recognized.

7. The connections of the sympathetic nervous system afferent fibers in the cord are still unsatisfactorily demonstrated.

Two of the most important procedures for the relief of visceral pain concern the alleviation of pelvic pain and that associated with angina pectoris.

Relief of pelvic pain by sympathetic neurectomy. In 1899 Jaboulay discussed operation on the sacral sympathetic nerves for dysmenorrhea, but the operation was not popularized until Cotte's article in 1925. The procedure involves the removal of the superior hypogastric plexus and the presacral nerve. This plexus and nerve represent part of a lower splanchnic system deriving fibers from the aortic plexus, which is formed by preganglionic fibers from the celiac ganglion and lumbar trunks. The presacral nerve is thus comprised of postganglionic fibers which supply the bladder, rectum and part of the pelvic genitalia. Removal of the presacral nerves and associated fibers, with or without partial denervation of the 4 or 5 cm. of iliac arteries, has been carried out largely by gynecologists, but also by neurosurgeons, in an attempt to relieve the pain of inoperable cancer and chronic painful infection in the pelvic viscera. Learmonth has paid particular attention to the results in this field. The operation consists in opening the peritoneum over the bifurcation of the iliac arteries and cleaning out all the fibers found in this triangular area. The operation has been loudly acclaimed by many gynecologists, but in our hands has not given more than 50 per cent of good results. Learmonth has had some satisfactory results in the relief of pain of intractable cystitis and in inoperable cancer of the bladder. But Chievitz* of the Finsen Institute in Copenhagen and others have found that the procedure is by no means so reliable as chordotomy, and have abandoned its use in cancer. Presacral neurectomy is followed by little disturbance of function except for sterility, — though not impotence — in man. There is no alteration of the normal menstrual cycle, and pregnancy is not affected.

Relief of Pain in Angina Pectoris by Procedures that Interrupt the Sympathetic Pathways. This constitutes perhaps the earliest attempt to interrupt afferent impulses over the autonomic nervous system. It began with a suggestion made by Francois Franck in 1899, but was first practiced by Jonnesco in 1916. The original procedure was elaborate, consisting in the removal of the three cervical ganglia and the stellate or first dorsal ganglion on both sides. Chiefly because of the technical difficulties, and in spite of the fact that Jonnesco's first case presented a most satisfactory result, the operative

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treatment of angina pectoris was not popularized. In 1923 Coffey and Brown, of San Francisco, recited their experience with 5 cases as showing that removal merely of the superior cervical sympathetic ganglion, or even division of the main branch from this ganglion to the heart, sufficed to ameliorate pain in angina pectoris. These successful results with such a simple procedure led to a general practice of operation on patients suffering with angina pectoris.

In addition to these surgical procedures, there arose the method of blocking the white rami at the point of emergence from the bony spine with procaine or alcohol. This method, introduced by Mandl and Swetlow, has been ably defended and popularized in Boston by Dr. James C. White. Its simplicity, in spite of the danger of the use of alcohol so close to the pleura and spinal cord, commends its trial, and the published figures reveal results which seem comparable to the more serious and cumbersome surgical methods. Even if these procedures fail ultimately to prove of great practical value in clinical medicine, the stimulation of the study of cardiac pain and the innervation of the heart will have been a distinct benefit to the profession.

Can we interpret intelligently the results obtained by such widely differing procedures? To do this one must appreciate what sympathetic fibers reach the heart and could be utilized by afferent stimuli. We know from the work of Cannon and his pupils that sympathetic fibers extend from the heart to the central nervous system, from the first dorsal to as low as the fifth or possibly the seventh dorsal sympathetic ganglion. We also know from the work of Langley, Gaskell and Ranson that the cervical sympathetic system has no sensory fibers above the cervical ganglia. Weighing this information in relation to the surgical procedures outlined above, we must interpret relief from simple superior cervical ganglionectomy as due to the effect upon the vessels supplying the heart. We know from adequate studies and surgical observations that all vessels are sensitive, and there is proof that the sensation is carried in sympathetic fibers. We also know that these fibers control vasomotor tone. In relation to the coronary vessels, however, there is no general agreement on their function as vasoconstrictors. It may be that Coffey and Brown by excising the superior cervical ganglion merely stabilized the coronary tone for the time being, and that this explains their favorable results.

When we come to interpret the results of the Jonnesco procedure, which may produce both a motor and a partial sensory effect, or the results accruing from cutting the white ramus to the upper two dorsal ganglia, or from injecting alcohol in order to interrupt these same conduction fibers, it is clear that if all connections with the heart are to be done away with we must extend our procedure from the first through at least the fifth dorsal level. Why, then, have favorable results been obtained? We can only state that this question cannot as yet be answered satisfactorily.

My own experience in this field comprises a considerable number of surgical attacks upon the sympathetic apparatus in the neck and upon the upper two dorsal ganglia. I have never been convinced that the relief afforded by such a procedure was complete or lasting. It is certain, however, that it has been satisfactory in a high percentage of cases. If we consider the mental as well as the physical anguish of patients with true angina pectoris, and remember that their lives are chiefly given over to waiting for the next attack, we must acknowledge that this procedure is highly desirable.

* * *

This short recital of a few methods for relieving pain emphasizes the inadequacy of our therapeutic measures. At the same time, it is apparent that when a direct attack upon a lesion causing pain is impossible, there are at least two alternate methods of possible relief,—one through section of some part of the somatic, and the other through a similar procedure on the autonomic nervous system,—which permit us to offer some help to our patients.

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PROGRESS IN NEUROLOGY IN 1936

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THE literature in the field of neurology during 1936 contains many topics of both physiological and clinical interest. Investigations on the complex functions of the hypothalamus continue unabated. From many laboratories the study of cerebral activity, both normal and abnormal, by means of electroencephalography is yielding interesting and valuable information. Elsberg's quantitative tests of the olfactory sense appear to be of definite help in the localization of lesions of the frontal region. Many other aids in diagnosis of neurological syndromes are described. No unusual therapeutic advances are reported.

PHYSIOLOGIC AND PATHOLOGIC STUDIES

Relation between the Cerebrum and the Cerebellum

The experiments of Aring and Fulton[1] throw light on the physiological relation between the frontal lobes and the cerebellum — two parts of the brain which may be confused in the localization of brain tumor. The authors have demonstrated that complete decerebellation in monkeys results in tremors in the head, hands and legs, the tremors being restricted to voluntary movement. Hypotonia, a symptom usually ascribed to cerebellar disease, was never observed, nor was flaccidity after complete removal of the cerebellum. Following severance of the contralateral cerebellar peduncles and removal of the excitable regions of the cerebral cortex (Areas 4 and 6*a*), ataxia associated with voluntary movements in the affected extremities was abolished. When the premotor cortex (Area 6*a*, upper part) was removed subsequent to severance of the contralateral peduncle, the cerebellar signs were accentuated. On the other hand, the cerebellar disturbances were temporarily abolished and permanently depressed when unilateral extirpation of Area 4 was done subsequent to a contralateral cerebellar lesion. From these observations the authors conclude that the premotor cortex is the part of the frontal lobe most intimately concerned in compensation for cerebellar deficit.

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Hypothalamus — Physiology

Having produced minute lesions in cats with the Horsley-Clarke apparatus, Frazier, Alpers and Lewy[2] concluded that mesially placed bilateral lesions on the floor of the third ventricle result in complete loss of temperature control, and that laterally placed lesions, whether bilateral or unilateral, cause only transitory and fleeting disturbances of temperature regulation. The vital area for temperature regulation in the hypothalamus is in the floor of the third ventricle, corresponding to the anterior hypothalamic nucleus in cats and to the substantia grisea in man.

That the hypothalamus is important in controlling temperature is supported by the findings in 2 cases reported by Alpers.[3] Temperatures of 106°F. and 107°F. respectively occurred just before death in these patients, both of whom had been operated on for suprasellar cysts. Autopsies showed in each case destruction of the floor of the third ventricle, especially in the substantia grisea area.

Confirmation that the hypothalamus is a sympathetic center was shown by Crouch and Elliott,[4] who utilized electrical stimulation of that region of the brain in twenty cats. The greatest rises in blood pressure were obtained by stimulating the anterior and lateral hypothalamic nuclei. Changes in respiration of various types were obtained, especially when the anterior, lateral and posterior hypothalamic nuclei and the lateral tegmental nucleus of the mesencephalon were stimulated. Dilatation of the pupil was induced by stimulating the whole hypothalamus, but was best obtained from the lateral area.

Because previous methods in localizing centers

in the hypothalamus seemed to lack the necessary finesse, Hess[5] has worked out a precise method for stimulating the various structures of this region. By his method he obtained in animals a marked decrease and increase in blood pressure and heart rate; changes in the frequency and amplitude of respiration; production of salivary flow, deglutition, vomiting, defecation and micturition; changes in the width of the lids and pupils, the nictitating membrane and the secretion of tears; and atony and increase in tone of the muscles. Sleep was never produced by stimulation of the hypothalamus, but was regularly obtained by stimulation of the confines of the subthalamus and thalamus.

Action Potentials of the Brain

From study of the action potentials of the brain in 23 persons, Davis and Davis[6] conclude that different people show different patterns of activity but that each reproduces his own characteristics. The individuality is not completely like that of a fingerprint, for cerebral activity is labile and dynamic, and the characterization is essentially statistical. The cortical electrogram apparently conforms to the biologic law of similarity of identical twins. Whether this is an organic hereditary feature is not known.

Walter[7] studied the electroencephalograms of 7 cases of brain tumor before and during operation. Large, slow waves involving the whole cranium were observed when the patients were under ether and in cases of increased intracranial pressure. After reduction of this increased pressure the slow waves were restricted to the areas of the tumor. Localization by the study of the slow waves is possible only when the tumor involves or affects the cortex itself, but the waves do not arise from the tumor but from the cortex. Although the region of the tumor was found in 4 cases, this method of study can be only supplementary to the other diagnostic procedures.

Experimental Catalepsy

Ingram, Barris and Ranson[8] were able to produce transient and prolonged catalepsy (plastic rigidity of the muscles) in cats by means of experimental lesions in the hypothalamus. Catalepsy lasted from seven to thirty days. In some cases, lesions involving the caudal part of the hypothalamus and the upper part of the mesencephalic tegmentum resulted in a syndrome characterized by initial somnolence, persistent loss of motor initiative, marked disinclination to walk, acceptance of passively induced poses, indisposition to eat when hungry and vacuity of expression. Many animals showed a suppression of emotional reactions. Study of the experimental lesions indicates that the symptoms were caused by damage to some structure or structures in the neighborhood of the mammillary bodies, such as the posterior hypothalamic nucleus, the supramammillary area, the lateral hypothalamic area and the region just caudal to the mammillary bodies.

DIAGNOSTIC STUDIES

Sense of Smell

Elsberg[9] has carried out extensive quantitative studies on the physiology and pathology of the olfactory sense by means of a special technic, in which blast and stream injections of coffee or citral are made into the nostrils at a known volume rate and pressure. The duration of olfactory fatigue was found to depend on the number of blast injections, the frequency of injection and the volume of odor injected in each blast. The minimum identifiable odor (M.I.O.) is also an important figure representing the smallest number of cubic centimeters of the odorous substance required for identification when injected into one nasal passage. In a clinical application of these tests on 47 verified cases of brain tumor, in or under the frontal lobes, Elsberg[10] was able to localize the growth in 46 instances. In 25 of the patients the tumor was extracerebral and lay underneath one or both frontal lobes. In these cases the M.I.O. was elevated on one or both sides, while the duration of fatigue produced by stream injection was not prolonged beyond the normal. In 11 patients the growth was within the substance of one or the other frontal lobe; in these the M.I.O. was elevated on the side of the tumor and the duration of fatigue was prolonged on the same side. In a patient with an intracranial tumor, in whom the M.I.O. was elevated but the duration of fatigue was not prolonged, the growth was situated underneath the corresponding frontal lobe. The author concludes that the tests of olfactory acuity and olfactory fatigue by blast injection and stream injection of odor are of value for the localization of tumors in or under the frontal lobes.

Value of Hyperpnea in Diagnosis of Certain Nervous Conditions

This test has been carried out by Massion-Verniory[11] as an aid in the anatomical location and evocation of signs and symptoms in certain nervous diseases. He found the test positive in 11 per cent of cases of cryptogenic epilepsy and in 37 per cent of cases of organic epilepsy. He was able to precipitate a convulsion after seventeen minutes in a patient who showed no signs of tumor. In this case the convulsion pointed to a focal

lesion in the right frontal area. Hyperpnea was also useful in bringing out pyramidal tract signs, such as in a case of cerebral thrombosis which showed normal reflexes before the test. The classical signs of Parkinsonism were also increased by hyperpnea in a large percentage of cases; the same was true of the signs of Sydenham's chorea. The test may also help to confirm the diagnosis of multiple sclerosis, of syringomyelia and of combined-system-disease.

Cerebral Angiography

By means of injecting thorotrast into the common carotid artery, Moniz[12, 13] has made more than 700 cerebral angiographies with no mishaps. He has refined his technic so that he is able to take arteriograms and phlebograms, including those of the cranial sinuses, in rapid succession. In order to outline the vessels in the posterior fossa, Moniz injects the subclavian artery. In the presence of lesions which compress neighboring vessels, definite distortions of the vascular tree are observed. For example, lowering of the carotid trunk may be diagnostic of a frontal lobe tumor, while elevation may be due to chiasmal tumors. Various other specific distortions of the vascular tree are described, being due to lesions in the posterior part of the frontal lobes or tumors of the parietal lobes, anterior temporal lobe or cerebellar pontine angle. By means of angiography, aneurysms and angiomas are diagnosed preoperatively. Three types of angiomas can be identified: arterial, venous and arteriovenous.

Diagnosis of Tumors of the Corpus Callosum by Encephalography

Of a series of 3000 air studies made by Dyke and Davidoff,[14] a diagnosis of tumor of the corpus callosum was made or suggested in 8 cases. Three cases were verified by necropsy, and in 2 diagnosis was confirmed by operation. Since there is no characteristic neurological syndrome by which the diagnosis can be made, the encephalographic evidence pointed out by these authors is of definite aid. The characteristic features of this condition as seen in the encephalogram are as follows: separation and asymmetrical distortion of the lateral ventricles without displacement of the ventricular system as a whole to either side; a sharply circumscribed defect in the dorsal margin of one or both lateral ventricles; occasional failure of one lateral ventricle to fill with gas; distortion of sulci and convolutions on the medial aspect of the brain; and deformity or obliteration of the dorsal and rostral portions of the fourth ventricle. The authors also point out the differential signs of other lesions which resemble tumors of the corpus callosum.

Changes in Physical Signs in Cerebellopontine Angle Tumor Following Lumbar Puncture

Helfer[15] reviewed 16 cases of acoustic tumor in which a lumbar puncture had been done. In 10 there was found to be an increase in physical signs after the removal of fluid. The author recommends that in cases of unlocalized lesions in which spinal fluid is removed the patient be reexamined for more definite or new signs after the puncture. An increase in signs following lumbar puncture has also been noted in extramedullary cord tumors.

EPILEPSY

Physiology and Pathology

On the basis largely of personal experience, Lennox[16] discusses the physiologic alterations of the body which may modify the frequency or severity of epileptic attacks. The induction of alkalosis by means of hyperpnea or by ingestion of large amounts of alkali tends to precipitate attacks, whereas acidosis diminishes the spells in certain individuals. The state of water balance in the body is also an important factor. The theory of vascular spasm is open to serious criticism, since records of patients taken immediately before and during spontaneous and induced seizures showed no decrease in cerebral blood flow. The author's experiments also show that during seizures there is no interference with the oxygen consumed by the brain. An acute decrease in the oxygen supply, however, may precipitate a seizure and an acute increase may inhibit it. The marked changes in the electrical potentials in the brains of epileptic patients and in those of normal individuals during the induction of alkalosis by hyperpnea, of anoxemia by breathing nitrogen, or of cerebral anemia, indicate that knowledge of the pathogenesis of epilepsy rests on ascertaining the physicochemical processes involved in the electrical activity of the neuron.

Gibbs, Lennox and Gibbs,[17] experimenting with electroencephalography, find that the characteristic three-a-second wave and spike pattern, which they had previously described, is pathognomonic of attacks of petit mal, and that furthermore the frontal lobe is more intimately connected with the source of pathologic electrical activity associated with petit mal than is any other cortical area accessible from the surface of the head. That the technic used by these authors is adequate in localizing the region of a disturbance in an attack of grand mal was demonstrated in a patient whose attack began with a right Jacksonian seizure: the abnormal electrical activity appeared in the record from the left motor cortex before it appeared in the record from the right cortex.

Lennox, Gibbs and Gibbs[18] have also demonstrated that electroencephalography is an aid in the evaluation of the various means of treatment; for example, pentobarbital and sodium bromide prevent or alter the pathologic activity associated with a seizure. In doses which are sufficiently large to modify the electrical activity during normal periods, these drugs prevent or modify the activity associated with a seizure of petit mal.

Surgical Therapy of Epilepsy

The surgical therapy of epilepsy is discussed by Penfield.[19] In idiopathic epilepsy, removal of the sympathetic nerves which follow the arteries to the brain has been attempted, but the results have been disappointing. Penfield states that there is no proof that vasomotor phenomena actually cause the attacks. Removal of the carotid body and denervation of the carotid sinuses should be carried out only when a specific hyperactivity of the carotid sinus exists. Subtemporal decompression is often adequate to correct rare cases of subdural exudations. Penfield finds that following head injury epilepsy is ten times more frequent in cases in which the dura is lacerated. In these instances, it is probable that the seizures result from subsequent formation of a meningocerebral cicatrix. Progressive contracture may be followed by convulsions as long as from fifteen to twenty years after the injury. Clean removal of such a scar without subsequent cicatrization, is possible. Of 22 such cases operated on, 46 per cent showed freedom from attacks and 33 per cent showed marked improvement in a five-year period.

MIGRAINE

Further favorable results with ergotamine tartrate are reported by O'Sullivan,[20] who followed 89 patients who had experienced over a thousand episodes. In only 8 did the drug fail to relieve the attacks either completely or partially. Ten other drugs failed to relieve them. The author found that the intramuscular route was the most effective. A dose of 0.25 mg. is sufficient for an initial injection, to be repeated in two or three hours if no relief is obtained. For oral use the dose is 1 mg. For the best results the drug should be given as early in the attack as possible. Untoward effects of the drug, such as nausea and vomiting, may be relieved by a simultaneous injection of atropine (1/100 gr.) or calcium gluconate intravenously. O'Sullivan's experience with ergotamine in migraine coincides with that of Lennox, von Storch and Solomon,[21] who found the drug effective in aborting individual migraine headaches in about 90 per cent of cases. Of 46 patients having nonmigrainous headaches, 15 per cent were relieved, 63 per cent were unrelieved and 22 per cent were made worse. Of 38 persons without headache who were given the drug, 16 per cent developed headache.

MYOPATHIES

Myasthenia Gravis

The pathologic physiology of myasthenia gravis is considered by many a deficiency of acetylcholine liberated at the myoneural junction or an increased destruction of acetylcholine by cholinesterase, with a resulting disturbance in normal contracture of muscle. If this is so, the efficacy of prostigmin is probably due to a destruction of the cholinesterase, which enhances the effect of acetylcholine produced in the body. In addition to the effectiveness of prostigmin, temporary amelioration of symptoms is obtained by glycine, ephedrine or benzedrine, and potassium chloride, the latter being given in 3-gr. doses four times a day at two-hour intervals. Although prostigmin may cause some relief of muscular weakness in diseases other than myasthenia gravis, the amelioration in the latter disease following its injection is so striking that Viets and Mitchell[22] find it a useful test in differentiating the disease and other conditions in which muscle strength is greatly impaired.

According to Norris,[23] changes in the thymus gland occur frequently in cases of myasthenia gravis, gross and pathologic alterations having been reported in 50 per cent of autopsied cases, including 2 of 4 cases observed by him. Various degrees of epithelial hyperplasia are found; when extreme it forms a localized and often encapsulated tumor-like mass, with obliteration of the usual lobular structure of the thymus. Norris believes that myasthenia gravis is best regarded as a disturbance of the neuromuscular mechanism, possibly on an endocrinal basis, rather than as a primary disease of the striated musculature or as one following metastases from a malignant thymus. Muscle lymphorrhagia (collections of lymphocyte-like cells in the muscles) appears to be a characteristic lesion of myasthenia gravis, having been found in two thirds of Norris's cases.

Muscular Dystrophy

The therapeutic results of glycine in 300 cases of muscular dystrophy hardly exceed those obtained from other forms of therapy, particularly pilocarpine-epinephrine, according to a survey of the literature made by Braestrup.[24] He treated 5 patients with muscular dystrophy, 4 with neurologic diseases affecting the muscular system and 4 with normal muscular systems. Fifteen grams of Merck's glycine was given twice daily in every case. In 1 of the 5 cases of dystrophy an undoubted improvement occurred; no benefit was observed in the others or in the neurologic cases. Increase

in the creatinuria occurred in all the cases following the administration of glycine, indicating that such a change is not specific for dystrophy.

DYNAMICS OF THE CRANIOVERTEBRAL CAVITY

Physiology and Pathology

By the technic of jugular and carotid punctures and Gibbs's thermoelectric blood-flow method, Loman and Myerson[25] have investigated some of the dynamic phenomena occurring within the human craniovertebral cavity. In contrast to the orthodox statements made regarding the physical make-up of the cavity, the authors, after stressing the relative ease in which dynamic conditions on one side of the cranial and vertebral cavities are reflected to the other side, mainly by virtue of the changes occurring in the venous system, prefer to designate the craniospinal container as semirigid. They give the following summary of intracraniospinal pressure relations and changes in blood flow and gaseous metabolism of the brain under normal and abnormal conditions:

(1) The cerebrospinal fluid pressure directly follows either a change in cerebrospinal venous pressure or a change in caliber of the cerebrospinal veins. The cerebrospinal fluid pressure is only indirectly related to changes in arterial pressure. Thus, a rise in arterial pressure does not affect the cerebrospinal fluid pressure unless the venous pressure, as a result, becomes increased. Studies on postural alterations particularly stress the direct relation between cerebrospinal fluid and venous pressure. Under ordinary physiological conditions, the venous pressure may be considered the chief factor in affecting the cerebrospinal fluid pressure. It is only under unusual conditions, such as severe metabolic disturbances, or under such conditions set up by injections of hypotonic or hypertonic solutions, that osmosis plays an important role in changing cerebrospinal fluid pressure.

(2) The cerebral blood flow is related to two important factors: (*a*) the arterial pressure and (*b*) the caliber of the cerebral vessels. Thus, a rise in general arterial pressure results in an increase in cerebral blood flow, unless there is an associated compensating cerebral vasoconstriction. Again, cerebral vasodilatation is followed by an increased blood flow through the brain unless there is an accompanying marked fall in arterial pressure.

(3) During change in posture from the horizontal to the upright, there is a fall in carotid pressure which is kept within normal limits, probably mainly by the vasomotor system. Associated with this fall in pressure, there is a diminished cerebral blood flow and a greater uptake of oxygen per unit of blood by the brain, as compared with those maintained in the horizontal position.

(4) In individuals who have unstable vasomotor mechanisms or arteriosclerosis, the assumption of the upright position may throw an overwhelming burden on the cerebral circulation, so that the carotid pressure and cerebral blood flow fall abnormally. As a result, there is a relative cerebral anoxemia with the production of cerebral symptoms, reaching their acme in syncope or convulsions. The administration of vasodilator drugs when combined with upright tilting in normal persons may produce similar phenomena.

(5) The response of the cerebral circulation to the administration of drugs depends upon the complex pressure-flow relation between the cerebral and general circulations. Probably the drug used in this study that was most dramatic in its effect was insulin. Moderate to large doses of insulin not only deplete the sugar in the blood, but may also produce a relative cerebral anoxemia, which probably explains the neurological symptoms in insulin hypoglycemia. That a relative cerebral anoxemia occurs during insulin hypoglycemia is indicated by the fact that although the blood flow through the brain tends to be diminished, there is a diminution in oxygen uptake by the brain as measured by the carotid-jugular difference in oxygen.

Von Storch,[26] in a study of craniovertebral dynamics, has made observations regarding some phases of the normal dynamics of the craniovertebral cavity which are similar to those of Loman and Myerson, and has also commented on the technic of encephalography. He states that replacement of cerebrospinal fluid by syringe through a single lumbar puncture produces alternate elevation and depression of the fluid pressure. Simultaneous replacement of fluid prevents these alternations and minimizes the patient's unfavorable reactions. When the fluid has been completely replaced by gas, the ventriculosubarachnoid space is a gas-filled system in which pressures at all points are equal, irrespective of position. The lumbar subarachnoid pressure in such a system therefore remains the same whether the patient be sitting or recumbent, and consequently the intracranial pressures remain unchanged. The production of a final lumbar subarachnoid pressure, after complete replacement of cerebrospinal fluid by a gas, which approximates the normal lumbar cerebrospinal fluid pressure for that patient when recumbent, is not dangerous. It results in excellent roentgenograms under normal pressure-volume relation, and does not increase the patient's reaction. It is possible to introduce a volume of air at room temperature greater than the volume of cerebrospinal fluid removed without significantly increasing the intracranial pressure. The introduction of a volume of air greater than the volume of fluid it replaces increases the reliability of the roentgenograms. Subsequent to encephalography, after the manner outlined, the cerebrospinal fluid pressure is not increased above its normal value. Von Storch further points out that alternate replacement of cerebrospinal fluid by a gas through a single aperture very probably produces alternate vasoconstriction and vasodilatation of the cerebral vascular bed with hyperemia, edema, hemorrhage and severe reactions. Furthermore, the reactions subsequent to encephalography are not due to increased intracranial pressure but quite likely to shock and meningeal irritation.

Reduction of Cerebrospinal Fluid Pressure by Certain Solutions

In a study on the relative values of caffeine, hypertonic dextrose and saline solutions in reducing the cerebrospinal fluid pressure in normal and in neurologic cases, Blau[27] comes to the conclusion that saline solutions are the most efficacious. He found that hypertonic dextrose solution caused only a temporary fall in pressure, and in only some of the cases. The effect of caffeine in depressing the pressure was also transient. Saline, 100 cc. of a 15 per cent solution, caused a fall in pressure in all cases, persisting for the full length of the experiment. No deleterious effects were observed.

Effect of Blood in the Subarachnoid Space on the Cerebrospinal Fluid Pressure

As a result of their experiments on dogs, Parker and Lehman[28] found that in lacerations of the brain the cerebrospinal fluid pressure varies directly with the amount of blood that escapes into the subarachnoid space, and not with the amount of bleeding within the cerebrum. This is probably due, the authors believe, to the increase in osmotic pressure of the fluid resulting from the introduction of blood proteins.

AFFECTIONS OF THE MENINGES AND SKULL

Spinal Arachnoiditis

This condition, which is usually diagnosed as cord tumor, is described by Elkington,[29] who analyzed 41 cases. The etiology is very obscure. Of 41 patients, 18 had no previous illness or injury which could be found to be related to the spinal condition. Of the remaining 23, a history of spinal trauma was obtained in only 9; in 3 cases the meningeal changes were confined to the neighborhood of the damaged vertebrae; in 3 cases infection aggravated the trauma; 8 cases showed a history of severe infection, including in 2 of them meningococcus meningitis. A history of syphilis was obtained in 4 men. Any part of the cord or cauda equina may be involved either focally or diffusely. The onset may be rapid or gradual. At the onset either pain of various degrees may occur, or as in many cases, the first symptoms may be those of spinal cord compression. The signs are essentially similar to those found in cord tumor. In 10 cases some abnormality of the spine was detected clinically, either tenderness on pressure or percussion over the affected area, or spinal rigidity. Complete block was found in 1 case, a partial block in 2. The total protein was estimated in 21 cases: it was normal in 11, slightly elevated in 4, and in 5 greatly elevated, the latter ranging between 110 and 200 mg. per cent. The prognosis is grave, but least so in cases operated on early, before irreversible changes have occurred in the cord itself. There was a satisfactory outcome in 7 of the 24 cases in which the subsequent course was known.

Selinsky[30] has reviewed 8 cases of disseminated spinal arachnoiditis. A variety of associated conditions suggests that the disturbance is not a specific response, but that a variety of agents may produce a reactive inflammation of the pia arachnoid. The author states that of the nonsurgical measures high voltage roentgen therapy gives the best results.

Meningococcus Meningitis

Hoyne[31] states that in the treatment of meningococcus meningitis the intravenous administration of serum or antitoxin is more efficacious than is the intraspinal route. Among 66 patients who received no intrathecal therapy the mortality rate was less than 12 per cent, in contrast to from 35 to 90 per cent when intraspinal treatment was used. For intravenous use the serum or antitoxin is diluted in 10 per cent dextrose or physiologic salt solution of at least twice the volume of the medicament, to which from 5 to 15 minims of epinephrine has been added. The mixture is kept at body temperature, and is given by gravity at the rate of about a drop a second. The dose of the serum is from 150 to 300 cc. an injection, depending on the patient's age. Hoyne prefers Ferry's antimeningococcic antitoxin, from 50,000 to 100,000 units being given at a time. He believes in the superiority of intravenous over the intrathecal treatment, on the assumption that meningitis is a bloodstream infection with an accompanying toxemia, rather than a disease process localized in the central nervous system.

Treatment of Brucella Meningitis

Poston and Smith[32] report 2 cases of this type of meningitis, which they treated intrathecally with fresh human immune serum. They describe a special technic which enabled them to isolate the organism in the spinal fluid. They state that Brucella infection should be suspected in cases of atypical meningitis. It can be treated by human serum obtained from persons who have been actively immunized by Brucella, or possibly from convalescent patients who have high agglutinating titers in their blood serums for the specific organism isolated. Patients who have no agglutinins for Brucella in their blood after recovery should be immunized with their own organisms so as to prevent an occurrence of the infection.

Calvarial Hyperostosis

Moore[33] has found various types of thickening of the calvarium in a study of several thousand

skulls. These deposits symmetrically involve the inner table of the bones or the diploe, usually in the frontal area, although the skulls are generally thickened. The condition causes a symptom-complex which is as characteristic as the skiagraphy. The symptoms consist of a more or less constant combination of headache, obesity or a tendency to obesity, muscular weakness and fatigability, nervousness, a tendency toward worry or depression, dimness of vision, epileptiform seizures, mental slowness to dementia, dizziness and disturbances of equilibrium and gait. Sometimes there is impairment of the seventh nerve, difficulty in speech, loss of the sense of smell, dragging of an extremity and hirsutism in women. Ninety-eight per cent of the author's cases occurred in women. The condition does not coincide with any of the groups of osseous dystrophies, and does not appear to form part of any endocrinal disease. It is a metabolic disease, in which the fat and calcium metabolism alone are at fault.

Carr[34] studied 17 patients with varying degrees of hyperostosis of the inner table of the frontal bones, causing symptoms similar to those found by Moore. Because of the high frequency of the obesity and the increase in dextrose tolerance, the author believes that many of the symptoms are metabolic in origin.

TRAUMA TO THE BRAIN

Mental Sequelae Following Head Injury in Children

Very little is found in the literature regarding mental sequelae following head trauma in children. Blau[35] gives the histories of 22 children with mental disorders following head injury. Among these were 6 cases of acute psychosis; 4 of these showed bloody spinal fluid and no neurologic signs except for meningeal irritation. The symptoms included acute excitement, marked impulsiveness and restlessness, complete lack of restraint, irritability and fear. In 5 cases the psychosis lasted from fourteen to thirty-five days. Follow-up histories obtained in 4 cases, ranging from six months to four years, failed to show significant sequelae. Twelve cases in Blau's group showed chronic behavior disorder: overactivity, restlessness, destructiveness, assaultiveness, cruelty to animals, emotional excitability, temper tantrums, truancy and delinquency. The prognosis in most cases was poor. No signs of focal disease of the central nervous system were evident. Post-traumatic epilepsy occurred in 5 children. The acute and chronic disorders differed only in degree and duration. The syndrome is undoubtedly based upon pathologic changes in the brain, probably of a diffuse type.

Brain Trauma in the Newborn

Despite the popular belief that asphyxia is frequently the cause of death in newborn children in cases of prolonged delivery, Heidler[36] holds that cranial injury is the primary cause. Autopsies on 76 birth injuries showed hemorrhage in the subdural spaces, in the leptomeninges and ventricles, and intracerebrally. In some cases tentorial tears and rupture of the pial vessels were found. Asphyxia is secondary to such brain injury, according to Heidler. To prevent these deaths, the author urges a shortening of the final stage of labor.

Therapy of Head Injury

In discussing the treatment of intracranial injuries, Dandy[37] gives the following suggestions. After the injury the patient should be put to bed immediately, and should not be subjected to x-ray or lumbar puncture, since these procedures are not necessary for diagnosis. More important is careful observation of coma or restlessness. Coma indicates increased intracranial pressure: if it deepens, the pressure is increasing; if it lessens, the pressure is being compensated. Restlessness shows that compensation is inadequate. Morphine should never be administered. Irregularity in the pulse rate and volume and a steady increase are both danger signs. Dandy believes that hypertonic solutions are unsatisfactory, since they have only a temporary effect and are injurious to the brain. Lumbar puncture, he feels, is also useless and results in later increase in pressure beyond the original level. The only acceptable treatment, according to him, is surgery. Operation is indicated at the point of breaking compensation or just beyond it. Small openings in the parietal region on the suspected side are made if localized signs are present. If fluid is not found, similar openings are made on the opposite side. If there is no relief of pressure, subtemporal decompression is done. Subdural hematoma, which develops later, is diagnosed by ventriculography. Extradural hematoma, with coma developing after a free period and convulsions spreading from the face to the arm and leg, is treated by removing the hematoma and tying off the branches of the torn meningeal artery.

Penfield and Norcross[38] describe the pathology of post-traumatic headache, and outline a special technic by which this condition is surgically relieved. The authors state that the pathological basis of true post-traumatic meningeal headache consists in an intimate adhesion of the arachnoid to the dura, which causes obliteration of the dural space in a smaller or larger area. The sensitive area, which is likely to be affected by this adhesion, is usually a meningeal artery in the dura, and less frequently a dural sinus. Chronic pain results from pressure or traction on one of these sensitive

areas, because of the rotation in the position of the brain produced by the blow and maintained by the adhesion. Two methods for injecting air, which reaches the subarachnoid and finally the subdural space about the involved area, are described. The technic is so devised that little or no air enters the ventricles. If sufficient air is injected, the brain, which is shrunken because of the collapse of the ventricles, pulls away from the overlying dural covering, with considerable traction due to its own weight. Of 25 cases so treated, 60 per cent were completely cured.

VASCULAR CONDITIONS

Intracranial Aneurysms

In a study of 31 cases of intracranial aneurysms, Robertson[39] observed that the onset occurred under varying conditions, sometimes during exertion, sometimes during sleep. The ages ranged from sixteen to fifty-five. Fourteen patients survived. In some cases death occurred within twenty-four hours. Of the aneurysms definitely located at autopsy, 6 were on the middle cerebral artery, 3 near its origin and 3 near the lateral sinus; 3 were at the junction of the anterior communicating and the anterior cerebral arteries, and 2 somewhat more peripherally on the anterior cerebral artery. Aneurysms are sometimes multiple. They are more prone to develop in cerebral than in systemic vessels because the former are larger and thin-walled and bear high pressure; they are poorly supported; sometimes the paired vessel in the circle of Willis is aplastic, subjecting its fellow to greater strain. Their treatment is unsatisfactory.

The diagnosis is often difficult until rupture has occurred. Thorpe and Clegg[40] report a case in which autopsy revealed four aneurysms on the circle of Willis, which were of considerable size but had given no diagnostic symptoms during life.

In cases of aneurysm of the intracranial portion of the internal carotid artery, as shown in a review of 29 cases from the literature and 8 cases observed by McKinney, Acree and Soltz,[41] diagnosis can be made by x-ray from the following findings: (1) calcification, forming a curvilinear shadow, with the convexity superiorly placed and slightly to one side of the sella turcica; (2) unilateral erosion of the sella turcica; (3) enlargement of the sella turcica; (4) unilateral enlargement of the optic foramen and superior orbital fissure; (5) erosion of the margins of the carotid canal; and (6) displacement of the pineal gland. Clinically the syndrome consists of exophthalmos and a partial or complete involvement of the second, third, fourth and fifth cranial nerves on the side on which the aneurysm exists. The third and fifth cranial nerves are always involved, and the others commonly.

Purpura Hemorrhagica with Intracranial Hemorrhage

According to Garvey and Stephens,[42] the frequency of sudden and often fatal intracranial hemorrhage in patients with purpura hemorrhagica has been underestimated. Of 30 cases of purpura which they observed, 7 of the 10 deaths followed intracranial hemorrhage. The histories preceding the onset of the hemorrhage were not significant. Bleeding into the mucous membranes was a common feature: all had hematuria, tarry stools and retinal hemorrhages. In 5 cases, in which necropsy was done, subdural or subarachnoid hemorrhage associated with bleeding into the brain substance was found. The commonest type of bleeding into the central nervous system is capillary-ring hemorrhage (brain purpura). Clinically the hemorrhage is associated with sudden hemiplegia, signs of subarachnoid hemorrhage, or coma and convulsions. The prognosis is grave and the treatment unsatisfactory.

ENCEPHALITIS AND ENCEPHALOMYELOPATHIES

Sequelae of Encephalitis Lethargica

The difficulty of prognosing the outcome of encephalitis lethargica of childhood is clear from Healy's[43] study of numerous selected cases of this disease. Thus, there was no correlation found between the intensity of the acute manifestations and the sequelae; nor was there any necessary relation between the intellectual function and the severity of the illness at the time of onset. Healy's study also substantiates the conclusions reached by others to the effect that damage to the central nervous system frequently continues long after the acute manifestations of the disease have disappeared. Because of this, "chronic encephalitis" would be more accurate than "postencephalitic sequelae."

Paroxysmal vegetative symptoms occurring as postencephalitic sequelae have been observed in 2 cases by Borremans and van Bogaert.[44] The attacks included vasodilatation with generalized sweating; tachycardia, often irregular; tachypnea or arrhythmic respiration, more or less periodic; hyperthermia; insatiable hunger and thirst; and increased abdominal peristalsis, even to involuntary evacuation.

Involvement of the Nervous System Associated with Influenza

In the course of epidemics of influenza, Laszlo and Nowotny[45] observed many cases showing mild involvement of the nervous system. While some patients developed a complete picture of Economo's encephalitis, the spinal cord and its meninges were principally involved, the lower extremities suffer-

ing the brunt of the attack. All cases presented more or less developed symptoms of meningomyelitis with a protracted duration. Some cases showed flaccid paraparesis and others only a slight decrease of power with pyramidal signs. Transient signs of meningeal irritation and neuritic irritation were also noted.

Mumps and Encephalomyelitis

Inflammation of the brain and the meninges in the course of mumps may be very marked, as observed by Jasinski.[46] In 1 case the meningeal symptoms were pronounced and were associated with high fever, intense headache and vomiting. The pathologic picture was that of a serous meningitis. Lumbar puncture showed a marked increase in pressure, clear sterile fluid and a high lymphocytic count — from 85 to 100 per cent. The course of the disease is stormy and short, and recovery is usual. In other cases of mumps the symptoms suggest encephalitis with involvement of the meninges.

Multiple Sclerosis

The various theories of the pathogenesis of multiple sclerosis are discussed by Brickner.[47] Experimental lesions similar to those seen in the brain in this disease have been produced in animals by Ferraro, who injected small doses of potassium cyanide, and by Putnam, who used tetanus toxin, carbon monoxide and cod liver oil. Putnam believes that the resulting patchy demyelination is due to the production of venous emboli and thrombi. Rivers and Schwentker produced similar lesions by repeated intramuscular injections of alcohol extracts of brain lipoids. Brickner himself attempted to find as a cause of multiple sclerosis a lipolytic agent which might affect myelin. He found that in active phases of multiple sclerosis the degree of blood-serum esterase activity was low, whereas during inactivity it was high.

Putnam[48] believes that the venular thromboses found in multiple sclerosis are primary and not secondary changes in the nerve tissue, and may be due to some fundamental disorder of the blood which results in clot formation in the cerebral vessels. He suggests that it may be possible to formulate a therapeutic program by lowering the level of fibrinogen by diet, by causing a decrease of platelets, or by administering an anticoagulant drug.

Nervous and Mental Sequelae in Carbon-Monoxide Poisoning

Shillito, Drinker and Shaughnessy[49] have collected records covering the accidents from carbon monoxide in the metropolitan area of New York City for ten years. During this period 21,000 exposures to the gas were recorded. A search of New York City institutions disclosed that only 42 case histories showed mental and nervous sequelae. From the histories it was evident that deep intoxication preceded all aftereffects. Artificial respiration and inhalations of oxygen and carbon dioxide had to be resorted to during treatment. Subsequent clinical manifestations were headache, dizziness, gastric distress and nausea due to cerebral edema induced by the poisonous gas. Temporary psychoses were the most frequent aftereffects of carbon-monoxide poisoning, common manifestations being confusion and loss of memory. Improvement within a few months was noted. Most of the psychotic patients were sufficiently improved in a year so that they could be paroled home. The more permanent neurologic lesions included 9 cases of muscular hypertonia (increased reflexes, ankle clonus and Babinski); 5 cases of hypertonia and some degree of peripheral neuritis (2 permanent); 4 cases of Parkinsonism (3 permanent); 1 case of Parkinsonism and some degree of peripheral neuritis; and 10 cases of peripheral neuritis. Ten deaths occurred before a complete neurological examination could be made.

Encephalopathy Following Extensive Burns

Only a few observers have been able to demonstrate involvement of the nervous system secondary to burns. Globus and Bender[50] report a case of an eight-year-old boy who received extensive second-degree burns. He recovered from the shock but showed increasing evidence of toxicity. The neurological examination was negative, but the patient developed an abnormal mental state, first refusing food and defecating and voiding in bed; later he became abusive to the nurses, expressed deep resentment against his parents, and gradually became unresponsive, withdrawn and subject to attacks of deep anxiety. He often expressed a desire to die. It is interesting to note that for a time psychiatrists who examined the patient thought that his mental state was due to psychic trauma caused by the accident which had led to regression to an infantile level. A short time later the patient rapidly became emaciated, and he died about six months after admission. The brain showed many changes resembling those of multiple sclerosis. It is probable that they were caused by a toxic agent formed in the disintegrating, burned tissues.

Involvement of the Nervous System in Trichiniasis

Merritt and Rosenbaum[51] report 2 cases of trichiniasis in which there were neurologic complications. The authors point out the difficulty of diagnosis. When trichiniasis involves the nervous system it may simulate polyneuritis, acute poliomyelitis, encephalomyelitis or, rarely, meningitis, although the spinal fluid is usually normal. It is difficult to explain the signs of polyneuritis, such

as generalized weakness and absence of reflexes. Such symptoms may be due to involvement of the nerves by the trichinae or a toxin elaborated by them. Dermatomyositis or periarteritis may also have to be considered in the differential diagnosis. In those cases of trichiniasis in which only the signs of polyneuritis are present, the prognosis is good. When mental symptoms or signs of focal lesions in the central nervous system are present the outlook is much more serious.

NEUROSYPHILIS

Etiology and Therapy

According to statistical reports made by Moore and Merritt,[52] syphilis of the nervous system was considered the cause of mental disease in 9.3 per cent of the total number of cases admitted to the Boston Psychopathic Hospital from 1912 to 1934. Menninger,[53] in a comprehensive study of the literature on the subject of juvenile paresis, concludes that this type of syphilis occurred in less than 2 per cent of all cases of paresis and in about 1 per cent of congenital syphilis. The onset occurred in most cases around the fourteenth year in girls and around the fifteenth year in boys. Therapy in juvenile paresis is very disappointing when compared with the results obtained in adult cases.

Kemp and Menninger,[54] in an attempt to correlate the treatment of early syphilis and the incidence of neurosyphilis, studied 680 cases in a large syphilitic clinic. This study showed that of 253 patients who had received no treatment, 52.6 per cent had neurosyphilis; of 226 who received early inadequate treatment, 43.4 per cent had it; and of 201 who received adequate treatment, 16.9 per cent had it. Kemp and Menninger also found that patients inadequately treated showed a six-year reduction of the incubation period of clinical neurolues when compared with a group receiving no treatment.

Epstein, Solomon and Kopp[55] found, in a review of the literature of the results of therapy of general paresis with fever produced by diathermy and related mechanical modes of hyperpyrexia, that of 648 cases reported between 1929 and 1935, good remissions were observed in 27 per cent. Of 33 patients treated by the authors with diathermy between 1931 and 1934, 8 were improved and working, and 7 were improved but not working. Four patients, while remaining hospitalized, were known to be improved, 4 patients were living but unimproved, and 10 had died. There appeared to be a correlation between the clinical status and the reaction of the spinal fluid.

Solomon and Epstein[56] also present a series of 21 cases — 19 of paresis and 2 of congenital neurosyphilis — treated over a continuous period of time by tryparsamide and subsequently given fever. These cases had previously shown unsatisfactory responses to tryparsamide alone. All these patients responded satisfactorily both clinically and serologically to the fever therapy. The authors believe that preliminary tryparsamide injections greatly enhance the possibility of therapeutic success in the treatment of general paresis by fever, and that the improvement of the spinal fluid findings occurs sooner after fever if the patient has been prepared for the treatment with tryparsamide.

Barnacle, Ebaugh and Ewalt[57] treated one series of 30 paretics with diathermy and tryparsamide, and an equal-sized group with malaria and tryparsamide. There was no essential difference in the beneficial results, for 70 per cent and 63.6 per cent, respectively, showed improvement. There was no correlation between serologic reaction and clinical improvement.

Good results with malaria treatment are reported by Hutchings,[58] who used this type of therapy for ten years. Of 182 male paretics, 66 were much improved. Tabetics showed less encouraging results. Patients with psychoses of less than one year's duration presented the best outlook.

CRANIAL AND PERIPHERAL NERVES

Carotid-Sinus Nerve Involvement

The carotid-sinus nerve, a branch of the glossopharyngeal, is a depressor nerve, section of which is apt to be followed by a temporary rise in blood pressure. Bucy[59] reports 5 cases in which it was necessary to expose and section the glossopharyngeal nerve. Following the operation in 3 cases there was a sharp rise in blood pressure, which became normal within a few days. In 1 case the blood pressure rose markedly after sectioning and remained at the higher level during hospitalization.

Syncope and convulsions due to hyperactive carotid-sinus reflex have been observed by Weiss, Capps, Ferris and Munro[60] in 52 patients. The treatment of the abnormal reflex is directed toward the correction of all associated abnormalities. The administration of digitalis should be carefully watched, since it sensitizes the sinus reflex mechanism. One patient was relieved by treatment of a tuberculous gland, 1 by antiluetic treatment, 2 by correcting food deficiency and 4 by diminishing the dose of digitalis. Of 10 patients who were treated by surgical denervation within the previous two years, 8 remained free from attacks and 2 had a recurrence of symptoms.

Neuralgia

Harris[61] reports that of 856 cases of tic douloureux 39 were bilateral. Of 41 patients with spastic paraplegia 7 had bilateral tics. The author believes that alcoholic injection is satisfactory for bilateral tic, even if it is necessary to perform both the injections at one sitting. If jaw droop results, re-

covery will take place because the motor roots will regenerate.

Horrax and Poppen[62] give the differential features of neuralgia affecting the head. Postherpetic neuralgia usually shows scars of herpetic vesicles involving the trigeminal nerve, and usually clears up in several weeks. The pain is not controlled by alcohol injection or posterior root section. In Sluder's or sphenopalatine neuralgia the pain is usually at the base of the nose, upper jaw and eye, radiating back to the ear and mastoid regions, and extending at times to the back of the neck, shoulder and upper extremity. Neuralgia due to involvement of the geniculate ganglion involves the sensory portion of the seventh cranial nerve, causing severe otalgia. Glossopharyngeal neuralgia involves the tonsils, pharynx and posterior part of the tongue. Pains due to sympathetic involvement are usually dull, aching, burning or elicited by pressure, and seldom follow the anatomic distribution of nerves. In mild cases of trigeminal neuralgia, inhalations of trichlorethylene are advised. Of 90 patients, nearly a half had sufficient relief so that they required no other form of therapy for as long as from six months to six years. If no relief is obtained by this treatment, alcohol injections are given. This measure is not only of therapeutic value but serves as a diagnostic test. Of 600 cases where injections were performed by the authors, the average period of relief was 14.3 months. Sensory-root operation is advised only if alcohol injection fails to give relief. It was performed on 176 patients without a single fatality; keratitis developed in 9 patients and temporary facial palsy in 6.

Treatment of Facial Paralysis

For cases of facial palsy that is complete and permanent, Davis and Cleveland[63] discuss two methods of surgical treatment: (1) an attempt to repair the atonic musculature by transplantation of fascia; (2) an attempt to effect an end-to-end anastomosis, or, when this is impossible because of scar and callus formation, suturing the distal end of the facial nerve and the central end of another nerve. Of the latter method, the most successful anastomosis was obtained with the hypoglossal nerve. Muscle tone and symmetry of the face quickly returned. Facial movements were at first associated with tongue movements, but after two years the patients were able to dissociate the two. Postoperative treatment consisting of mechanical devices, electrotherapy and educative exercises is also advised.

Bertola, Yadarola and Sala[64] recommend the operation of Leriche for facial palsy not amenable to conservative treatment. This consists of resection of the superior cervical ganglion, resulting in paralysis of Müller's muscle so that drooping of the eyelid occurs. Associated with the ptosis of the lid there are enophthalmos and miosis, vasomotor symptoms and abundant salivation. Many of the symptoms gradually disappear. The tonus of the cheek improves and the nasolabial fold recovers practically its normal form. Excellent results in 3 cases are described.

Postoperative Neurologic Complications

The many neurologic conditions which may occur during convalescence from an operation are discussed by Woltman.[65] The peripheral nerve disorders include neuritis of the ulnar nerve due to pressure of the arm on the operating table; peroneal palsy due to pressure on the underlying mattress or crossing of the legs; and brachial palsy in women, which may follow pelvic operation or be caused by poorly padded shoulder rests, asymptomatic cervical ribs or faulty posture during narcosis. Certain cranial nerves may be involved, notably the sixth, less often the third and fourth. The cause of the latter involvement is unknown. Before deciding on surgery the presence of deficiencies should be determined; otherwise, pathologic conditions may be precipitated. The author cites a case of a woman who since limiting her food intake because of a fecal fistula had developed combined-system-disease of the cord; death occurred three days after spinal anesthesia for resection of the sigmoid. Another patient after living on milk and eggs for six months developed Korsakoff's syndrome after gastroenterostomy. The various types of psychoses following operation are also discussed.

Dietary Deficiency as Etiologic Factors in Certain Neurologic Syndromes

In Perkins's[66] observation of 82 cases of neurologic conditions in which multiple neuritis was conspicuous and which included alcoholism, pernicious anemia, cancer of the intestinal tract, malnutrition and pregnancy, he found digestive disturbances constantly present. In every case a logical explanation for the lack of intake or failure of proper digestion or assimilation could be made. The varieties of clinical syndromes were very similar to those seen in such deficiency diseases as beriberi, pellagra and sprue.

Neuritic Manifestations in Diabetes Mellitus

Jordan[67] presents findings in 120 cases of diabetes with relatively acute and usually severe neuropathy. Among 1000 consecutive cases of diabetes observed by the author, there were 25 cases of neuritis, which involved the legs in 16. Pain, paresthesia, hyporeflexia and areflexia, muscle paresis, tenderness of the nerves and muscle, hypesthesia and hyperesthesia were the most frequent manifestations. The spinal fluid contained excess protein. Hyperglycemia did not appear to be an essential factor in the production of the neuritis. Evidence

of vascular disease, primarily arteriosclerosis, was present in a large percentage of the cases; arteriosclerosis, however, may be the result of the diabetic factor rather than the cause of the neuropathy. Deficient dietary intake seemed of no significance, as judged by the dietary histories and the result of feeding accessory food substances. Marked improvement in symptoms and signs occurred within a few weeks in many cases, and within a few months in most.

Jolliffe, Colbert and Joffe[68] present data which tend to confirm the hypothesis that alcohol neuritis is caused by avitaminosis. The authors made a survey of 26 alcoholics with neuritis and 16 alcoholics without it. They employed Cowgill's formula which expresses the vitamin-B need as the quotient obtained by dividing the vitamin-B equivalent expressed in milligrams by the total caloric intake. Normally this ratio should be about 2. It was found that the vitamin intake was inadequate in all 26 patients with neuritis, but was adequate in most of the 16 without neuritis.

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CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

ANTEMORTEM AND POSTMORTEM RECORDS AS USED IN WEEKLY CLINICOPATHOLOGICAL EXERCISES

FOUNDED BY RICHARD C. CABOT, M.D.

TRACY B. MALLORY, M.D., *Editor*

CASE 24101

PRESENTATION OF CASE

A forty-three-year-old Italian shoemaker was admitted complaining of a tender swelling on the right leg.

The patient had been well until three months before entry when he first noted a small tender area on the medial aspect of the right tibia. The sensation was "burning" in character and the leg ached after walking. There had been no injury to this region, nor were there any other associated symptoms. The local application of various self-administered medications produced no relief. Six days before coming to the hospital the pain increased in severity, and slight swelling was noted in the area involved. There were no other significant symptoms. His weight had been stationary for three years.

The past history was noncontributory.

Physical examination showed a well-developed and nourished man in no evident discomfort. Examination of the head and neck was negative except for a pea-sized, firm, non-tender node in the right cervical region. The lungs were clear. The heart was normal. The blood pressure was 150 systolic, 100 diastolic. The abdomen was soft, and there were no areas of tenderness. A mass was felt in the left upper quadrant which extended two fingerbreadths beneath the costal margin. No notch was felt, but the edge was sharp. A rectal examination was negative. At the juncture of the middle and upper thirds of the posterior portion of the medial surface of the right tibia there was an area of roughening of the bone about 2.5 cm. in diameter. The skin in this region was warm and slightly reddened, and pressure over it produced pain. The remainder of the examination was negative.

The temperature, pulse and respirations were normal.

Examination of the urine was negative. No Bence-Jones protein was found. The blood showed a red-cell count of 6,700,000 with 86 per cent hemoglobin. The white-cell count was 8800, 79 per cent polymorphonuclears, 8 lymphocytes, 12 monocytes, and 1 eosinophils. The serum calcium was 9.52 mg. per cent, the phosphorus 5.08 mg. per cent, and the phosphatase 4.28 Bodansky units. A blood Hinton test was negative.

An x-ray showed an ovoid area of bone destruction within the middle portion of the shaft of the right tibia (Fig. 1). The lesion lay within the marrow but involved the central portion of the cortex. The area was fairly well outlined, and there was no evidence of newbone formation or periosteal reaction. No soft-tissue mass was seen. There was a fusiform thickening of the cortex of the left tibia at the middle third of the bone. The lesion was in no way related to the lesion on the right and might have been the result of an old fracture. An x-ray of the chest showed the heart to be transverse in position, slightly enlarged, and there was calcification of the aortic knob. The lung fields were clear. An abdominal film demonstrated calcification of the pelvic arteries. The other bones exhibited no variation from the normal. The left kidney was slightly larger than the right and appeared to be displaced downward. A retrograde pyelogram showed the kidney outlines on the right side to be normal in size and position. Both psoas outlines were well visualized. The left kidney pelvis lay at the level of the third lumbar vertebra and appeared to be displaced somewhat laterally. The minor calices were well defined. The course of the left ureter was directly to the right of the lower border of the second lumbar vertebra at which point it turned sharply downward and followed its usual course. No calculi were seen. Another film showed the

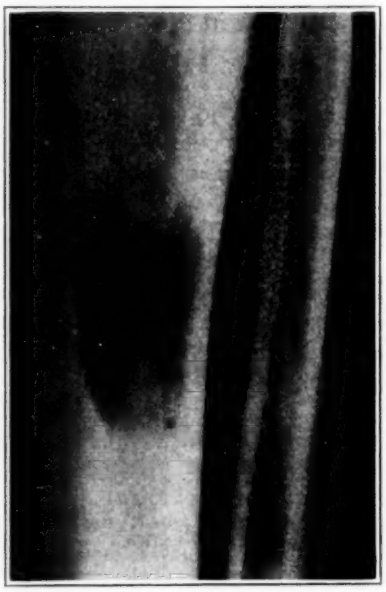

Figure 1. *X-ray photograph of midportions of the right tibia and fibula.*

outline of the left kidney to be slightly larger than the right and low in position.

On the sixth hospital day an operation was performed.

Differential Diagnosis

Dr. Channing C. Simmons: There are one or two further points I should like to know. In the physical examination no mention is made of enlargement of the thyroid or parathyroid glands. I presume they were negative. I rather question one or two statements about the bones in the x-ray examination. May we look at the films to see if the other bones are normal? The diagnosis is one of five or six conditions: (1) inflammatory condition, (2) some form of metabolic disease, (3) one of the rare skeletal diseases, (4) primary bone tumor, (5) one of the other tumors, sometimes primary in bone, such as malignant lymphoma or reticulum-cell sarcoma, (6) metastatic tumor.

The possible inflammatory conditions are tuberculosis, osteomyelitis and syphilis. I think we can rule out tuberculosis. Acute osteomyelitis in a man of his age is unusual. It is also unusual to have a Brodie's abscess without more thickening of the cortex, from irritation, above and below the cavity. Moreover his blood was normal except that the white-cell count showed 79 per cent polymorphonuclears, which is high, and the monocytes were high — 12 per cent.

Syphilis always has to be borne in mind. The Hinton test was negative. The syphilologists tell me that 40 per cent of the cases of tertiary bone syphilis have negative Wassermann reactions. The Hinton is of course more sensitive but not infallible. Consequently, although it is negative, syphilis has to be considered.

Metabolic disease such as Paget's disease and parathyroid disease should be considered. I should say the bones were not normal. I do not know how Dr. Holmes feels about them. Is that the x-ray of a normal humerus?

Dr. George W. Holmes: I think part of the appearance is due to the fact that the film was not taken in the usual position.

Dr. Simmons: Is that not a thick bone?

Dr. Holmes: Yes it is, and is somewhat suggestive of Paget's or syphilis.

Dr. Simmons: Is the appearance due to position?

Dr. Holmes: I should not say that the femurs were abnormal. In this region you have a thickening of the cortex which does not indicate disease. You might get such an appearance with an old fracture. I think you can rule out an inflammatory condition.

Dr. Simmons: As regards Paget's and parathyroid disease, the blood chemistry seems to be normal. If it were Paget's disease one would expect a higher phosphatase; 4.28 units is practically normal according to the Bodansky method. One would expect it to be 8 or 10 in Paget's disease.

I think we can rule out the rare skeletal diseases. They are certainly not suggested by the x-rays.

We come down to primary bone tumor, metastatic tumor, reticulum-cell sarcoma and lymphoma. Primary bone tumor in a man of forty-three is unusual, except Ewing's sarcoma which does not originate in this situation. It is a bone-destructive tumor and is usually not situated in the center of the shaft of the bone. One has also to consider giant-cell tumor; giant-cell tumors arise at the end of the bone, not in the center, and are clear cut where they join the shaft. They expand rather than destroy the cortex. We then come to reticulum-cell sarcoma and lymphoma. The x-ray does not suggest lymphoma. Reticulum-cell sarcoma appears by x-ray as a mottling of the medulla or as a bulky tumor with bone destruction, and the films do not suggest this type.

Any malignant tumor may give bone metastases although they occur much more commonly with cancer of the thyroid or breast and with hypernephroma. This man has a tumor connected with his left kidney which apparently has given no symptoms so far as the urinary tract is concerned. He has never passed blood, and this is suggestive of hypernephroma situated at the top of the kidney. A tumor so placed does not involve the calices and therefore does not give any blood in the urine. My feeling would be that we have a metastatic tumor of the tibia, the probable origin of which is a tumor of the kidney, a hypernephroma. The x-ray is our best single method of diagnosing bone tumor but not the last word.

Dr. Tracy B. Mallory: Have you anything further to add, Dr. Holmes?

Dr. Holmes: I should like to confirm the statements Dr. Simmons has made. It is true when you come to look at all the bones in this patient that he has rather heavy, short bones, and it is also true that they were not adequately described in the text. Thickening in the cortex of bones, as seen in the left tibia, always makes one suspect syphilis, but this particular lesion is localized and can better be explained on the basis of an old fracture. When we come to the lesion in the shaft, it is a purely destructive process with no attempt at new bone formation. For that reason I should agree with Dr. Simmons that it is metastatic and not a primary tumor. Its location and the character of the lesion itself point to a metastatic process. In re-

gard to the kidney, any lesion which displaces the kidney and its pelvis downward, as this does, in all probability is either in the kidney itself or retroperitoneal, very close to it. Lesions in the abdomen do not displace the kidney downward. I think it is perfectly safe to say that the mass causing the displacement is part of the kidney or in some way connected with it. Tumors of the cortex of the kidney as a rule involve the pelvis. They cause some distortion of the pelvis — more distortion than is seen in this case. But you can have a considerable tumor without distortion of the pelvis. A tumor large enough to displace the kidney downward should give evidence of involvement of the pelvis. The character of the lesion in the bone is quite typical of metastasis from a kidney tumor.

Dr. Mallory: Have you any comment, Dr. Smith?

Dr. George G. Smith: I do not remember seeing this case so I am not prejudiced. I should agree entirely with what Dr. Holmes has said about the difficulty of assuming a tumor of the kidney cortex because, as he very well pointed out, if you had a tumor large enough to push the kidney down this far you certainly would expect to see some narrowing or abnormality in the upper calyx. So far as I can see, the outline of the kidney is fairly normal. A tumor of the adrenal could certainly push the kidney down. I suppose this is the type of case where one would be tempted to do oxygen or air insufflation of the suprarenal area. It is not entirely without danger but has been done by some men very frequently. I always thought that metastases from hypernephromas which lodged in bone were found at the ends of the bone, the theory which has been advanced being that the small emboli of tumor cells were held up at the point where the larger arteries subdivide into smaller ones at the junction between the shaft and the epiphysis. I suppose that does not hold in every case, but generally speaking if it were a hypernephroma metastasis, I would expect it to be at the end of the long bone. There has been no blood in the urine. I can see no reason to think that the kidney per se was involved except on the theory that this tumor might be a metastatic hypernephroma. There is no evidence of involvement of the kidney, the only thing being the fact that it is pushed down.

Dr. James H. Means: What about the sharp edge of the tumor? What about the six and a half million red-cell count? I do not think they can be dismissed.

Dr. Mallory: Apparently no attention was paid to them.

Dr. Means: I do not know of any bone lesion that gives an erythremia, but I should like to ask you if any sort of thromboses in the bone marrow could be the cause of such a condition as this, because patients with erythremia would thrombose anyway.

Dr. Mallory: I never saw gross lesions of the bone produced in that way. Only a single red-cell count was done.

Preoperative Diagnosis

Metastatic hypernephroma of the tibia, right.

Dr. Simmons's Diagnosis

Metastatic tumor, probably hypernephroma.

Anatomical Diagnosis

Carcinoma of the adrenal.

Pathological Discussion

Dr. Mallory: The lesion of the bone was biopsied, and a small amount of material curetted out. In the sections we found an epithelial tumor composed of fairly large cells, with prominent cell membranes and very light semivacuolated cyto-

Figure 2. *Left kidney with adherent tumor of the adrenal.*

plasm. The appearance was so close to that of hypernephroma that I had no hesitation in making a flat-footed diagnosis of metastatic hypernephroma. That seemed to settle the differential diagnosis, and it was decided since there seemed to be a single metastasis it was worth while to go ahead and remove the primary tumor. It was done through an anterior approach by Dr. Allen, who found a very large tumor lying above and closely attached to the kidney. He did not attempt to discover whether it was in the kidney but removed the tumor and kidney together. The tumor was very adherent to the jejunum and was separated with a great deal of difficulty. When the tumor was finally removed and examined it was clear that it

was not in the kidney. As you can see from the photograph (Fig. 2), which was taken after the specimen had been dissected, the tumor lay medial to and slightly above the kidney and though closely attached to it could readily be separated from it. When the sections of the primary tumor were available it was evident that it was a primary carcinoma of the adrenal. The subsequent course of the patient was a little stormy. He developed intestinal obstruction in the jejunum in the region from which the tumor had been resected, so it proved necessary to resect about 60 cm. of the jejunum. He survived that and is symptom free now, just a year later.

CASE 24102

Presentation of Case

A forty-four-year-old white Canadian lumberman entered the hospital with the complaint of progressive blindness of fourteen months' duration.

Fourteen months before entry while working in the woods he suddenly developed almost total blindness. However, in about fifteen minutes his vision cleared so that he could continue his work, but he still had difficulty in seeing. Twelve months before entry the entire right side of his body suddenly became numb. He felt dizzy and fell to the ground. He felt faint but did not lose consciousness. For about ten minutes he was unable to get up and after that could not continue his work because of severe occipital headache. For the subsequent two or three days the muscles of the right side of his body were very sore. The headache disappeared but recurred for brief intervals whenever he lifted heavy objects. For the next six months whenever he looked upward he saw 25 or 30 blue balls, like bunches of grapes, and had a sensation that the "earth was going over backwards." This sensation stopped as soon as he looked down. Six months before entry his left eye became totally blind and gradually the vision of his right eye became more and more impaired until he could see only out of the nasal side of it. He also began to have severe temporal headaches lasting twenty-four hours, and the movements of his legs became clumsy and unsteady. He had no auditory, olfactory, or other cranial-nerve symptoms; and he was able to continue his work up to a short time before entry. There was no memory loss or change in habits.

He had been married for twelve years and had seven children living and well. One had died of pneumonia and three had died in infancy. He said he had had all the childhood diseases except scarlet fever and diphtheria. Twenty years before entry he had been struck by a derrick arm on the left side of the face and knocked unconscious, but had had no cerebral symptoms following the incident. He denied venereal disease, and had had no neuromuscular symptoms except those given above.

Physical examination revealed a well-developed and nourished man in no apparent discomfort. There was slight tenderness over the right mastoid and over the occipital protuberance. His heart, lungs and abdomen were negative, and his blood pressure was 110 systolic, 68 diastolic. The right side of his face was covered with drops of perspiration, but the left side was warm and dry. The left eye was totally blind, and there was complete temporal hemianopsia of the right eye. The fundi were normal, and the disks were slightly pale. There was slight cloudiness of the left cornea. The right pupil reacted sluggishly to light and accommodation, and the left pupil showed only consensual light and accommodation reflexes. There was no diplopia, squint or nystagmus, and the cranial nerves were otherwise negative. The vibratory sense and the motor and sensory systems were normal. There was a positive Romberg and a slightly unsteady gait, but no rebound phenomena. Position sense was normal, and the finger-to-nose and heel-to-knee tests showed no incoordination. Stereognosis was normal. The reflexes were entirely negative.

The temperature was 98.6°F., the pulse 50. The respirations were normal.

The urine examination was negative. The blood showed a red-cell count of 5,250,000 with 95 per cent hemoglobin, and a white-cell count of 12,100 with 76 per cent polymorphonuclears. A lumbar puncture showed an initial pressure of 100 with normal dynamics. The fluid was clear and colorless, contained no cells, and showed a total protein of 56 mg. and a sugar of 66 mg. per cent. The goldsol curve was 0001221100, and the spinal fluid Wassermann was negative.

X-rays of the head showed marked thickening of the skull, prominence in the supraorbital region and in the lower jaw, large sinuses, large pacchionian bodies in the frontal region, and slight increase in the convolutional markings. The sella was large, the posterior clinoids were slightly atrophic, and there was slight spreading of the anterior clinoids.

On the evening of the fifth day after entry he called the nurse and said there was something the matter with him. Immediately afterward he became stiff, pushed his right leg and arm out from under the bedcovers, and began to have rapid, violent clonic convulsions of the whole right side of his body accompanied by fine convulsions of the

left side. He was unconscious, and his eyes were closed. For the next five minutes the convulsions continued intermittently, and he licked his lips continuously. Finally the convulsions ceased, and he regained consciousness although his body remained stiff. The blood pressure was 120 systolic, 80 diastolic, after the convulsions. The right pupil was dilated and reacted only very slightly to light. He said that he felt dizzy and faint, and that the right side of his body was numb. The ankle jerk and arm reflexes were more active on the right; the knee jerks were both very active and equal; the right plantar reflex was equivocal, the left was normal; and there was sustained clonus on the right and unsustained clonus on the left. The following morning he was found lying face down on the floor breathing heavily with his mouth open. His eyes were partially open, staring straight ahead, and his face expressionless. His body was tense, and his arms were shaking. He was incontinent of urine and when spoken to answered incoherently. His pulse was very slow, strong and somewhat intermittent; and his blood pressure was 150 systolic, 70 diastolic. He could not state definitely how long the attack had lasted, and he remained restless and irrational for about an hour. Late that afternoon he suddenly got out of bed, seemed very dazed, and made aimless movements with his hands. He resisted attempts to put him to bed and then suddenly became comatose with gasping respirations. A left ventricular puncture was done as soon as possible, and the ventricle was found to be full of fluid blood. His condition improved somewhat after this, and an attempt was made to decompress the suprasellar region through a burr hole in the left temporal area. A cyst-like wall was punctured in the region of the sella, and about 6 cc. of partially clotted blood was removed. Several hours later a second ventricular tap was done without much improvement, and he died shortly thereafter.

Differential Diagnosis

Dr. James B. Ayer: For localization of the lesion the eye symptoms are obviously of greatest importance. The first symptom of illness was sudden transitory blindness, followed by progressive loss of vision first in the left, then in the right eye. This course strongly suggests a lesion at or near the only place where the visual pathways meet, that is, the optic chiasm, and this supposition is made more certain by the examination which discloses pallor of both optic disks and absence of light response in the left pupil. Whether due to pressure from above the chiasm or from below, or to a disorder of the optic pathways, is not certain at first, but shortly after the initial eye symptoms, numbness of the entire right side of the body and falling to the ground suggest disturbance of sensory and motor pathways, cephalad to the pons on the left side; and absence of unconsciousness seems to exclude cortex as the seat of this attack. Numbness, weakness and increase in reflexes, found later, can best be explained by pressure upon the left crus cerebri. These two groups of symptoms, the visual and the sensorimotor, appear to place the lesion above and to the left side of the optic chiasm. The development of epilepsy later can well be explained on the basis of further extension of pressure to the uncus of the temporal lobe, a favorite origin for convulsions.

I see no evidence to point to direct labyrinthine or cerebellar dysfunction to explain vertigo on looking upward or slight unsteadiness.

What is the pathologic lesion? The evidence is in favor of a progressive expanding lesion, with several sudden attacks causing sudden loss of function in the territory mentioned. As blood was found in the lateral ventricle following one of these attacks, it is reasonable to think of aneurysm or a vascular neoplasm which bleeds periodically causing the acute symptoms mentioned in the history. Death seems to have been due to bleeding into the third ventricle.

The principal tumors to be considered as causing the above chain of events comprise two groups. First, there are those arising in the pituitary body itself and subsequently expanding through the diaphragm of the sella to cause pressure on neighboring structures. The preservation of the sella, although somewhat enlarged and the lack of outstanding endocrine symptoms (although some acromegaly is suggested by x-ray) render such tumors unlikely, although not excluded. Suprasellar tumors form the second group. Of these, the meningioma arising from the sella turcica or sphenoidal ridge must be considered, but probably excluded because its enlargement would be very slow and is not usually accompanied by violent access of symptoms. Tumors arising from cell rests in the pituitary stalk satisfy the given clinical course; they are frequently cystic and highly vascular.

Aneurysms in this neighborhood, arising from the anterior cerebral or anterior communicating arteries, single or bilateral, may cause progressive blindness, and by repeated bleeding produce transitory pressure upon neighboring structures. One would expect an aneurysm to rupture into the subarachnoid space, but there is no reason why it should not rupture into the third ventricle. The finding of a cyst-like wall containing blood clot suggests aneurysm although not excluding tumor.

Putting the evidence together it seems to me

that localization can hardly be other than suprasellar, primarily on the left side. We have less evidence as to the type of lesion. The commoner lesion would be a suprasellar tumor with repeated hemorrhages, but I cannot recall seeing in the literature or noting in our own cases repeated exacerbations of symptoms with pressure on neighboring structures, as must be the case here, in such tumors, whereas that does occur frequently in aneurysm. So in spite of the fact that it is a rarer condition in this region I should put first, aneurysm with fatal rupture — a fairly good-sized aneurysm, — with suprasellar tumor, secondly, — one which has bled repeatedly, — and thirdly, a tumor of the pituitary which has outgrown the confines of the sella and has become suprasella in location.

Dr. Tracy B. Mallory: Dr. White, you saw this patient. Have you anything to say?

Dr. James C. White: Our first admission diagnosis was suprasellar cyst, and it was not until we had evidence of blood in the ventricle that we began to feel that it must be aneurysm. Perhaps if Dr. Ayer had not known about that he would not have made it his first choice.

Dr. Ayer: The hemorrhage into the ventricle would not disturb me, but finding a sac of blood is unlikely in tumor and is characteristic of aneurysm. I still may be wrong.

Dr. White: He had headaches, which could be attributed to arachnoid bleeding.

Dr. Ayer: No evidence for or against that.

Dr. White: The other evidence was that as he chopped trees and watched the stump he could not see the axe until it got there.

Dr. William B. Breed: Would the absence of calcification by x-ray make you more certain that it was not suprasellar cyst.

Dr. Ayer: A good many of these tumors do not have calcification. If we did find it, I think it would be against aneurysm.

Dr. Breed: I just wondered how high a percentage does show calcification.

Dr. Ayer: I should have that information at my tongue's tip but I cannot recall. A number do: that is all I can say.

Clinical Diagnosis

Suprasellar cyst with hemorrhage.

Dr. Ayer's Diagnoses

1. Aneurysm, suprasellar.
2. Tumor, suprasellar.

Anatomical Diagnosis

Aneurysm of the left internal carotid artery.

Pathological Discussion

Dr. Charles S. Kubik: This was a ruptured aneurysm, a very unusual one, both because of its large size and its position. It was right above the sella and originated from the left internal carotid artery.

There is not much more to be said about it. There was blood in the ventricles, as well as in the subarachnoid space. The diagram shows where the aneurysm was situated.

oc — optic chiasm
A — aneurysm
lic — left internal carotid
pc — posterior cerebral artery
p — pons
b — basilar artery
mc — middle cerebral artery

Dr. Mallory: There was a terminal subarachnoid hemorrhage.

Dr. Aubrey O. Hampton: What was the condition of the sella turcica?

Dr. Kubik: There was slight erosion.

Dr. Ayer: It was shown by x-ray.

Dr. Henry R. Viets: There is no evidence that it was syphilitic?

Dr. Ayer: The tests were all negative. Most of these intracranial aneurysms are not syphilitic.

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THE MASSACHUSETTS PROBLEM OF ADEQUATE MEDICAL CARE

Fortunately for the people of this country there are, in professional groups and among sociologists and philanthropists, men and women with vision and mental poise who are earnestly striving to relieve the misfortunes found among the victims of maladjusted social environment and of disease. Of these groups the physician is recognized as an important factor in bringing to bear remedial measures.

A great variety of plans have been formulated and experiments carried on designed to ameliorate the predicaments of those who seem to be unable to work out for themselves the solution of the problems involved. The medical profession has become conscious of its responsibility in co-operating with other agencies in dealing with disease and the associated economic factors, and has affirmed its readiness to give the quality and degree of service that is indicated.

With these objects in view, organized medicine in this State has, through the Massachusetts Medical Society, pledged its best efforts to meet the medical needs of all the people. This sentiment was made manifest through the creation of the Committee on Public Relations several years ago, which was composed of representatives of the eighteen district medical societies. In order to deal with problems connected with adequate medical care a subcommittee was appointed consisting of Dr. Ernest L. Hunt, chairman, and Dr. Halbert G. Stetson and Dr. Patrick J. Sullivan with instructions to study the economic conditions relating to adequate medical care for the people of Massachusetts.

In order to secure available information relating to the subject, a survey of 500 Massachusetts families comprising 1820 individuals, covering the economic burden incident to ill-health and many other associated matters, was carried on. Two years were devoted to this task, and a report of the committee's findings was given to the Council of the Massachusetts Medical Society, June 8, 1936, with recommendations which were approved. The survey disclosed the facts that untreated and imperfectly treated cases of illness existed in Massachusetts and that inadequate financial resources of patients accounted for a considerable proportion of the poor medical care, with other important contributing conditions set forth in the sixteen explanatory divisions. This study is being continued, and in a recent paper presented to the Worcester District Medical Society, Dr. Hunt declared that in at least thirty per cent of the cases of illness in Massachusetts there is some inadequacy of medical care.

The remedial measures designed to meet the conditions set forth in the report of this committee consist, first, in the creation of health councils in each district-society area, whose functions would include the education of the people as to the needs and possibilities of medical service and measures for securing it, the provision of suitable clinics, the obtaining of co-operation from industrial, fraternal,

social and health organizations, the establishment of welfare-department responsibility for medical care of the indigent and near-indigent, and the broadening of the functions of the local hospitals. It was further recommended that a State Health Council be established, which would act as a coordinating unit for the district councils and would serve as a deliberative body for consideration of the broader aspects of the problems. In the report of another subcommittee, the chairman, Dr. Channing Frothingham, declared that "the indigent sick in any community could be cared for by the individual physician through the proper authorities." Plans for the fulfillment of this principle are now in operation in Franklin County and in various townships in other counties.

Although this report has been published in full in the Proceedings of the Massachusetts Medical Society, reference to it seems to be appropriate at this time, in order to stimulate more interest in the propositions set forth and thereby induce the district societies to put the recommendations in effective operation.

In this connection it is of interest to refer to the editorial in the *Journal of the American Medical Association* of January 15, where it is recorded that the Executive Committee of the Board of Trustees of the American Medical Association has adopted resolutions which cover practically all the important recommendations made by the subcommittee of the Massachusetts Medical Society and referred to above.

FUROR SCRIBENDI

It should be axiomatic that investigative work done in and published from teaching centers that are recognized as authoritative be both instructive and convincing. Unfortunately it requires only a superficial perusal of any medical journal to demonstrate that, in this respect at least, axioms are not what they used to be. "Competitive investigation," "furor scribendi," the adulation of the general public for the individual who screams loudest in print, and the commensurate increase in his earning capacity, all lead to bigger but poorer journals. This is especially anachronistic in medicine since honesty of thought as well as accuracy of observation lies at the very foundations of this particular science. It is also true that the fault, if it be one, of publishing ill-considered and what might be called anemic papers lies equally with the editorial boards of these journals. Their action can be explained, and to some extent excused, by the fact that they still think that they provide what their readers want, especially as the latter have given no sign to the contrary.

A recent example of this sin against Aesculapius has been provided by a solemnly expounded thesis which deals with and draws conclusions from the study of less than twenty instances of an annoying physiologic condition that may affect slightly less than fifty per cent of the millions of people who form the population of the United States. Even the authority resident in the imprimatur from what is admittedly one of the leading institutions of this country cannot justify failure to use experimentally a few more, at least, of the possible millions before rushing into print. The observations made and conclusions drawn are unquestionably accurate. The reasons for publication, however, are—to put it mildly—inadequate, and as a matter of charity must be laughed at rather than condemned. However, it does not really matter! The paper can still be used to light a fire which will, after all, warm those who can but will not write, at the expense of those who will but should not.

MASSACHUSETTS MEDICAL SOCIETY

SECTION OF OBSTETRICS AND GYNECOLOGY

M. Fletcher Eades, M.D., *Secretary*
19 Bay State Road
Boston

Case History No. 62. Separated Placenta At Term

Mrs. M. A., a thirty-nine-year-old multipara, was admitted to the hospital on January 13, 1932, because of bleeding; she was in labor and at term. The bleeding had begun two hours previously, was profuse and continued until admission. The pa-

A series of selected case histories by members of the section will be published weekly.
Comments and questions by subscribers are solicited and will be discussed by members of the section.

tient had felt no fetal motions for twenty-four hours.

The family history was unimportant, and her past history was essentially negative. There had been thirteen full-term pregnancies and one early miscarriage. In 1912 a pelvic abscess developed after one delivery and this was drained.

The patient was not followed in the prenatal clinic and so far as was known had had no prenatal care at all. Physical examination on admission showed a woman who had evidently lost a good deal of blood. The mucous membranes were pale. The lungs were normal, and there were no rales. The heart showed no murmurs or enlargement. The sounds were very weak, with regular rhythm and a rate of 64 per minute. The blood pressure was 50 systolic, 30 diastolic. The abdomen showed a full-term uterus in constant contraction. No fetal heart sounds were heard, and no fetal motions were felt. Rectal examination revealed that the head was in the pelvis, and the cervix dilated to admit two fingers. She was still bleeding.

The patient was at once given 500 cc. of 10 per cent glucose with 15 units of insulin, intravenously; morphine and sodium amytal were given to control the patient's restlessness. Her blood was taken for typing, and a compatible donor secured. A Spanish windlass was applied to the abdomen and pressure made on the uterus. The patient was also given Thymophysin to stimulate uterine contraction and hasten delivery. During this time the blood pressure remained very low, the pulse rate was 64 per minute but the volume small. The patient was in severe shock. At 1 p. m., 1000 cc. of saline solution was administered under the breasts; 500 cc. of citrated blood was transfused at 4 p. m., at which time the patient's pulse was becoming weaker. Hot water bottles and blankets were applied and restoratives given. The patient had been bleeding since admission, and by 6 p. m. it was quite evident that she was steadily losing ground. After consultation among the staff it was decided that the patient's only hope was immediate delivery. Under nitrous oxide the membranes were ruptured, dilatation of the cervix was completed, and a dead baby delivered by internal podalic version; the baby weighed 5 lb., 9 oz. The uterus did not contract well, and the patient continued to bleed; hence, the uterus was firmly packed. As the patient was in very poor condition, she was given oxygen and carbon dioxide, intravenous glucose and injections of caffeine and sodium benzoate; but her condition grew steadily worse, and she died at 7:55 p. m.

At autopsy, approximately 200 cc. of thin fluid blood was found on opening the abdominal cavity. The important features of the examination are given in the following extracts: "The serosa of the jejunum and ileum show occasional dark-red areas completely encircling the wall for a distance of about 7 cm. Otherwise the serosa is negative. The stomach contains approximately 2 liters of thin bright-red blood. The duodenum, jejunum and upper end of the ileum contain similar bright-red blood. Upon washing this away, the mucosa lining the stomach, duodenum and jejunum is markedly injected, the capillaries being very prominent and strongly suggesting a possible source of oozing. This capillary engorgement is most marked beneath the regions of redness in the serosa, above noted. No frank rupture of vessels can be found. The esophagus shows no evidence of varices. At no point in the gastrointestinal tract is there any evidence of cancer."—"The uterus is massively distended and thinned, extending upward halfway to the umbilicus. Its serosa is smooth and glistening. Beneath it are extensive extravasations of blood. At no point is the uterine wall more than 1 cm. in thickness. It is completely packed with blood-soaked gauze. The endometrium is reddened and, over the recent site of placental attachment, is completely raw. The cervix is widely dilated, easily admitting one's fist."

The following are extracts from the microscopic examination: *"Ileum.* The wall, per se, is negative. The capillaries of the villous processes are enormously distended and in many places frankly ruptured."—*"Uterus.* The musculature is thinned, shows generalized degeneration and is markedly edematous and in places hemorrhagic. The endometrial surface shows no evidence of infection."

Comment. It must be remembered that this case was treated in 1932. Like treatment today would be open to a good deal of criticism. Transfusion should not have been delayed twelve hours; the patient should have been transfused as soon as she entered the hospital. It is fair to state that a woman who had had thirteen children and who had a baby that weighed only 5 lb., 9 oz., would have been delivered normally long before 6 p. m. had the present-day method of rupturing the membranes as soon as she reached the hospital and applying a Spanish windlass been instituted. The internal podalic version followed by immediate extraction of the child through a cervix that was not dilated possibly added to the shock. Although there is no urinalysis reported, it is quite probable that this woman was suffering from a toxic separation of the placenta and that the blood in her stomach resulted therefrom. While the pathological findings in the jejunum and ileum are not pathognomonic of toxic separation, they are quite compatible.

MEDICAL POSTGRADUATE EXTENSION COURSES

The following sessions, given by the Massachusetts Medical Society in co-operation with the Massachusetts Department of Public Health, the United States Public Health Service and the Federal Children's Bureau, have been arranged for the week beginning March 14:

BARNSTABLE

Sunday, March 20, at 4:00 p. m., at the Cape Cod Hospital, Hyannis. Subject: Gonorrhea in the Male. Instructor: Roger C. Graves. John I. B. Vail, *Chairman.*

BERKSHIRE

Thursday, March 17, at 4:30 p. m., at the House of Mercy Hospital, Pittsfield. Subject: Some Complications of Labor: Analgesics in Labor. Instructor: Christopher J. Duncan. Melvin H. Walker, Jr., *Chairman.*

BRISTOL SOUTH (Fall River Section)

Monday, March 14, at 4:30 p. m., at the Union Hospital, Fall River. Subject: Bleeding in the First Trimester of Pregnancy. Instructor: M. V. Kappius. Howard P. Sawyer and Robert H. Goodwin, *Chairmen.*

ESSEX NORTH

Friday, March 18, at 4:00 p. m., at the Lawrence General Hospital, Lawrence. Subject: Bleeding in the First Trimester of Pregnancy. Instructor: Judson A. Smith. John Parr, *Chairman.*

FRANKLIN

Wednesday, March 16, at 8:00 p. m., at the Franklin County Hospital, Greenfield. Subject: The Use and Misuse of Prontylin. Instructor: Benjamin W. Carey, Jr. Halbert G. Stetson, *Chairman.*

HAMPDEN

Thursday, March 17, at 4:00 p. m., at the Academy of Medicine, Professional Building, 20 Maple Street, Springfield, and at 8:00 p. m., in the Outpatient Department of the Skinner Clinic, Holyoke Hospital, Holyoke. Subject: Recent Advances in the Diagnosis and Treatment of Heart Disease. Instructor: Sylvester McGinn. George D. Henderson and George L. Schadt, *Chairmen.*

HAMPSHIRE

Wednesday, March 16, at 4:15 p. m., in the Nurses' Home, Cooley Dickinson Hospital, Northampton. Subject: Gonorrhea in the Male. Instructor: Oscar F. Cox, Jr. Warren P. Cordes, *Chairman.*

MIDDLESEX EAST

Tuesday, March 15, at 4:00 p. m., at the Melrose Hospital, Melrose. Subject: Acute Anterior Poliomyelitis — Its Diagnosis and Treatment. Instructor: R. Cannon Eley. Joseph H. Fay, *Chairman.*

MIDDLESEX SOUTH

Wednesday, March 16, at 4:00 p. m., at the Cambridge Municipal Hospital, Cambridge Street, Cambridge. Subject: Atelectasis in the Newborn. Instructor: Clement A. Smith. Edmund H. Robbins, *Chairman.*

NORFOLK

Friday, March 18, at 8:30 p. m., at the Norwood Hospital, Norwood. Subject: The Use of Vitamins in Pediatric Practice. Instructor: Louis K. Diamond. Hugo B. C. Riemer, *Chairman.*

PLYMOUTH

Tuesday, March 15, at 4:00 p. m., in the Rosa Field Nurses' Residence, Brockton Hospital (rear of hospital), Brockton. Subject: Differential Diagnosis and Treatment of Scarlet Fever. Instructor: Charles F. McKhann, Jr. Walter H. Pulsifer, *Chairman.*

DEATH

GUGENBERGER — JOSEPH GUGENBERGER, M.D., of 460 Park Avenue, Worcester, died February 28, 1938. He was in his forty-fifth year.

He was a native of Alsace-Lorraine, but came here when very young. He received his early education in Holyoke and later went to the Worcester City Hospital to study nursing. At the outbreak of the World War he postponed his training to serve as a sergeant in the Medical Corps at Fort McHenry, Baltimore, Md. After the Armistice he returned to the Worcester City Hospital and finished his training, graduating in 1920.

For four years he practiced as a graduate nurse in New York City and then began premedical training at Columbia University. In 1928 he enrolled at the Long Island College of Medicine, received his degree in 1932, and served his internship at the Worcester City Hospital. Three years ago he established a practice at his home.

Dr. Gugenberger was a member of the American Medical Association and a fellow of the Massachusetts Medical Society.

His widow, two brothers, and two sisters survive him.

MISCELLANY

ANNOUNCEMENT OF THE FRANCIS AMORY SEPTENNIAL PRIZE OF THE AMERICAN ACADEMY OF ARTS AND SCIENCES UNDER THE WILL OF FRANCIS AMORY

In compliance with the requirements of a gift under the will of the late Francis Amory of Beverly, Massachusetts, the American Academy of Arts and Sciences announces the offer of a septennial prize for outstanding work with reference to the alleviation or cure of diseases affecting the human genital organs, to be known as the Francis Amory Septennial Prize. The gift provides a fund, the income of which may be awarded for conspicuously meritorious contributions to the field of knowledge "during the said septennial period next preceding any award thereof, through experiment, study or otherwise . . . in the diseases of the human sexual generative organs in general." The prize may be awarded to any individual or individuals for work of "extraordinary or exceptional merit" in this field.

In case there is work of a quality to warrant it, the first award will be made in 1940. The total amount of the award will exceed ten thousand dollars, and may be given in one or more awards. It rests solely within the discretion of the Academy whether an award shall be made at the end of any given seven-year period, and also whether on any occasion the prize shall be awarded to more than a single individual.

While there will be no formal nominations, and no formal essays or treatises will be required, the Committee invites suggestions, which should be made to the Amory Fund Committee, care of the American Academy of Arts and Sciences, 28 Newbury Street, Boston, Massachusetts.

RÉSUMÉ OF COMMUNICABLE DISEASES IN MASSACHUSETTS FOR JANUARY, 1938

DISEASES	JANUARY 1938	JANUARY 1937	FIVE-YEAR AVERAGE*
Anterior poliomyelitis	0	1	1
Chickenpox	2196	1772	1786
Diphtheria	17	20	63
Dog bite	640	580	451
German measles	57	76	241
Gonorrhea	376	519	505
Lobar pneumonia	532	843	835
Measles	566	4024	2714
Meningococcus meningitis	3	13	10
Mumps	618	719	905
Paratyphoid B	1	0	0
Scarlet fever	1163	991	1150
Syphilis	433	510	425
Tuberculosis, pulmonary	270	295	292
Tuberculosis, other forms	38	26	33
Typhoid fever	7	3	6
Undulant fever	2	5	2
Whooping cough	599	2167	1172

*Based on figures for preceding five years.

RARE DISEASES

Diphtheria was reported from: Athol, 1; Boston, 7; Chelmsford, 1; Fall River, 1; Haverhill, 1; New Bedford, 1; Revere, 1; Taunton, 3; Woburn, 1; total, 17.

Dysentery, bacillary, was reported from Danvers, 4; New Bedford, 1; Somerville, 1; total, 6.

Malaria was reported from Newton, 1.

Meningococcus meningitis was reported from Boston, 2; North Reading, 1; total, 3.

Paratyphoid B was reported from Greenfield, 1.

Pfeiffer bacillus meningitis was reported from Norfolk, 1.

Septic sore throat was reported from Athol, 1; Boston, 10; Gardner, 5; Medford, 1; Northfield, 2; Quincy, 1; Salem, 2; Somerville, 1; Springfield, 1; Sturbridge, 2; total, 26.

Trichinosis was reported from Brookline, 1; Medford, 1; Quincy, 1; total, 3.

Typhoid fever was reported from Boston, 1; New Bedford, 1; Quincy, 1; Somerville, 1; Springfield, 1; Worcester, 2; total, 7.

Undulant fever was reported from North Adams, 1; Quincy, 1; total, 2.

Diphtheria showed a record low incidence.

The incidences of scarlet fever and tuberculosis (other forms) were reported above the five-year average.

Pulmonary tuberculosis had record low figures with the exception of January, 1933, which showed an equally low incidence.

Lobar pneumonia, whooping cough and measles were reported at figures considerably below the five-year average.

The incidence of undulant fever was not remarkable.

Meningococcus meningitis was reported at a record low figure.

Chickenpox showed record high incidence both for this and any other month to date.

The incidences of mumps and German measles were below the five-year average.

Anterior poliomyelitis showed record low incidence.

The incidence of animal rabies was not remarkable.

New foci were reported in Brockton and Dunstable. Previously noted foci in Lowell and the North Shore were active.

STUDY OF NURSING FOR THE TUBERCULOUS

The lack of standards for nursing in tuberculosis sanatoriums has been so much complained about to people with whom national nursing organizations and the National Tuberculosis Association correspond that a study is proposed.

Its first object is to determine what constitutes adequate nursing care of tuberculosis patients. Secondly, it is proposed to gather information that will provide an index of the amount of time needed to give that care. The project will be under the direction of the Department of Studies of the National League of Nursing Education.

Dr. Sumner H. Remick, superintendent and medical director of the Middlesex County Sanatorium at Waltham, has been advised by Dr. Kendall Emerson, managing director of the National Tuberculosis Association, and Miss Mary A. Hickey, R.N., chairman of the Joint Committee for the Study of Tuberculosis Nursing, that the Middlesex County Sanatorium has been selected as one of the limited number of institutions where the study will be made.

Dr. Remick has replied favorably indicating that he hopes that the study will be of service not only to his but to other tuberculosis sanatoriums.

VOCATIONAL SERVICE BUREAU OF THE AMERICAN PHYSIOTHERAPY ASSOCIATION

Trained physiotherapists are always available through the Vocational Service Bureau of the American Physiotherapy Association. This association was organized very soon after the close of the World War, the charter members being former reconstruction aides-in-service. Since then the membership has increased to more than 800. The present requirements for membership are: an approved course in physical therapy of not less than nine months, following graduation from a school of nursing or physical education which meets with the requirements of the individual states and one year's practice in physical therapy within two years of graduation from an approved school of physical therapy. These requirements have been approved by the Council on Medical Education and Hospitals of the American Medical Association. The object in having these qualifications for membership is to provide, for the hospitals, schools for crippled children and offices of physicians, trained physiotherapists who are able to follow physicians' orders intelligently and thoroughly.

Those desiring such service should communicate with Miss Edith Munro, 483 Beacon Street, Boston (Ken. 8000).

CORRESPONDENCE

PATHOLOGICAL TECHNIC

To the Editor: While heartily agreeing with the reviewer in his praise of Dr. Sidney Farber's valuable book *The Postmortem Examination,* I feel that I must take exception to one statement by the reviewer: "There are minor faults, such as . . . the indication that removal of the organs of the neck is a standard and usual procedure in autopsy technic." I can hardly believe that the reviewer meant to imply that routine examination of the organs of the neck is not standard and usual. I believe that what he did mean to imply was that removal of all

the organs of the neck, including trachea, larynx and tongue, is not a usual procedure at least in adults.

Any pathologist who regards an autopsy complete without careful examination of the thyroid, cervical lymph nodes and parathyroids, together with inspection in situ of the trachea and larynx, can hardly be said to be performing a standard autopsy.

SHIELDS WARREN, M.D.

New England Deaconess Hospital,
Boston, Massachusetts.

ARTICLES ACCEPTED BY THE AMERICAN MEDICAL ASSOCIATION COUNCIL ON PHARMACY AND CHEMISTRY

To the Editor: In addition to the articles enumerated in our letter of February 7 the following have been accepted:

Abbott Laboratories
- Sulfanilamide — Abbott
- Tablets Sulfanilamide — Abbott, 5 gr.
- Tablets Sulfanilamide — Abbott, 7½ gr.
- Ampules Ephedrine Hydrochloride 5 per cent and Procaine Hydrochloride 1 per cent, 1 cc.
- Ampules Ephedrine Hydrochloride 2½ per cent and Procaine Hydrochloride 1 per cent, 2 cc.
- Ampules Silver Nitrate Solution, 1 per cent
- Hypodermic Tablets Procaine Hydrochloride, 1/3 gr.-Epinephrine 1/4000 gr.

Bilhuber-Knoll Corporation
- Metrazol Sterile Aqueous Solution 10 per cent
- Hypodermic Tablets Dilaudid Hydrochloride, 1 mg. (1/64 gr.)
- Hypodermic Tablets Dilaudid Hydrochloride, 1.25 mg. (1/48 gr.)

International Vitamin Corp.
- I.V.C. Viosterol (A.R.P.I. Process) in Oil
- I.V.C. Cod Liver Oil Vitamin Concentrate Tablets

Lakeside Laboratories, Inc.
- Ampules Mercury Succinimide 0.01 gm. (1/6 gr.)

Lederle Laboratories
- Mixed Grasses Pollen Antigen — Lederle (June Grass, Orchard Grass, Sweet Vernal Grass, Red Top and Timothy in equal parts)

PAUL NICHOLAS LEECH, *Secretary.*

535 North Dearborn Street,
Chicago, Illinois.

REPORT OF MEETING

THE WILLIAM HARVEY SOCIETY

A meeting of the William Harvey Society was held on January 14 at the Beth Israel Hospital. Dr. James J. Hepburn presided and after a brief historical review of thoracic surgery introduced the speaker of the evening, Dr. Edward D. Churchill, who spoke on "Thoracic Surgery."

In opening his talk he pointed out that progress in surgery of the chest had lagged behind that of other branches of surgery until the last 10 or 15 years because thoracic surgery depends on an accurate knowledge not only of anatomy, pathology and principles of asepsis, but also of the principles of cardiorespiratory physiology. The rapid development of the x-ray, the use of radio-opaque oil in injections and the use of the bronchoscope are other important factors in the development of this prominent branch of surgery.

Empyema is the most frequent of the surgical diseases of the chest which is seen by the general practitioner and which requires speedy treatment. The principles used in the treatment of empyema are: first, drainage of the pus by a method suited to the patient so that there will be no further crippling of the cardiorespiratory functions; secondly, a restoration of the function of the lung; and thirdly, the obliteration of the infected cavity. The general practitioner must make an early diagnosis and should use an aspirating needle if there is doubt. It is important to know when to remove the drainage tube, as much damage can be done by leaving the tube in too long. Chronic empyema is a distressing condition which usually results from improper treatment. Lantern slides of a case of chronic empyema were shown. These cases require very extensive surgery.

The field of tuberculosis has only recently been invaded by thoracic surgeons. The first operation of this sort that was done in Boston occurred in 1920. The fundamental principle upon which this type of therapy is based is putting the diseased lung at rest and repairing the damage by collapsing the cavities. Pneumothorax is used wherever possible and is effective when a good collapse can be obtained. In certain cases adhesions will prevent this method from giving collapse, and in many of these cases the adhesions can be severed. The phrenic nerve at times is crushed to help put the lung at rest. Thoracoplasty is used where other means are not effective, the ribs being resected over the pleura. The progress in this operation has been rapid in the last decade, and at the present time a good collapse can be obtained without deforming the patient excessively. Dr. Churchill spoke briefly on tuberculous empyema and pointed out the importance of always demonstrating pyogenic organisms before draining any empyema because if it is tuberculous it should not be drained.

In the treatment of patients with lung abscesses the careful combination of medical and surgical care is necessary. In certain cases drainage is done, but a needle should never be introduced because of the danger of causing pyopneumothorax. Dr. Churchill warned against tonsillectomy's being done in the home, particularly under general anesthesia, because of the danger of postoperative lung abscess. In certain cases it is necessary to remove a whole lobe of the lung in order to get rid of the abscess.

In the treatment of bronchiectasis it is found that simple drainage or collapse is not effective. The involved lobe must be removed. The mortality in these cases at the Massachusetts General Hospital since 1930 has been 4.4 per cent. Usually the patients are debilitated at the time operation is contemplated.

Primary carcinoma of the lung seems to be on the increase. It is absolutely necessary to have early x-rays and determine the cause of chest symptoms, because the surgical treatment of this condition depends entirely on the early diagnosis. One lobe, two, or an entire lung may be removed for this condition. Total pneumonectomy is still a dangerous operation. Operation in these cases is feasible in about 30 per cent. In the 18 cases done at the Massachusetts General Hospital, 6 are living, 5 are dead of metastases and 7 died following operation. Benign tumors usually cannot be differentiated from carcinoma. Hemoptysis is often an early symptom in these cases. Examples of this type of tumor are dermoid cysts, echinococcus cysts, thyroid adenomas and neurofibromas.

Tumors of the ribs which occur near the chondral junction are frequently slow-growing chondrosarcomas, and the entire rib should be removed. Dr. Churchill closed by stating that there were many other problems of

chest surgery, including surgery of the esophagus, diaphragmatic hernias and the removal of adenomatous goiters. He feels that great progress will be made in the future.

NOTICES

REMOVALS

ARAM KAVALGIAN, M.D., announces the removal of his office to 435 Mt. Auburn Street, Watertown.

JAMES B. HICKS, M.D., announces the removal of his office to 1101 Beacon Street, Brookline.

TUMOR CLINIC, BOSTON DISPENSARY

Each Tuesday and Friday morning from ten to twelve-thirty there is a meeting of the Tumor Clinic of the Boston Dispensary, a unit of the New England Medical Center. All kinds of tumors are seen, discussed, and when indicated, treated with radium and high-voltage x-ray.

Physicians are welcome to visit this clinic and bring a patient to the clinic for diagnosis.

THOMAS WILLIAM SALMON MEMORIAL LECTURES

The Salmon Committee on Psychiatry and Mental Hygiene invites the medical profession and its friends to The Sixth Series of Thomas William Salmon Memorial Lectures.

This series will be given by Dr. David Kennedy Henderson, physician-superintendent of the Royal Edinburgh Hospital for Mental Disorders, Scotland, April 18, 19 and 20, at the New York Academy of Medicine, 2 East 103rd Street, at 8:30 p. m.

Dr. Henderson will speak on "Psychopathic States" according to the following schedule:

April 18. Their Place in Psychiatry.
April 19. Their Characteristics as Evidenced by Aggression, Inadequacy and Creativeness.
April 20. Their Understanding and Synthesis.

Dr. Henderson is professor of psychiatry at the University of Edinburgh and is well known as a consultant and lecturer. He was a major in the World War and the author of several papers on the war psychoses. He holds the degrees of F.R.C.P. (Edinburgh) and F.R.F.P.&S. (Glasgow) and is the author of more than thirty publications on psychiatric subjects.

THE SIR WILLIAM OSLER SOCIETY

The annual lecture of the Sir William Osler Society of Tufts College Medical School will be given on Friday evening, March 18, in the auditorium of the Beth Israel Hospital, at 8:00. Dr. Henry A. Christian will speak on "The Fruition of the Clinician."

STANLEY STELLAR, *Secretary.*

NEW ENGLAND SOCIETY OF PHYSICAL MEDICINE

The next regular meeting of the New England Society of Physical Medicine will be held at the Hotel Kenmore, Boston, on Wednesday evening, March 16, at 8 o'clock. The council will meet at 6:00, and informal dinner will be served at 6:30 in the Empire Room.

Dr. Heinrich Brugsch and Dr. Joseph H. Pratt will speak on "The Indications and Contraindications of Ultra Short Wave Therapy" based on observations of cases treated at the Boston Dispensary. Discussion: Dr. William D. McFee.

All members of the medical profession are cordially invited to attend.

WILLIAM D. McFEE, M.D., *Secretary.*

THE GEORGE W. GAY LECTURE ON MEDICAL ETHICS

The George W. Gay Lecture on Medical Ethics "A Few of the Rules" will be given by Dr. Reginald Fitz, in amphitheater E of the Harvard Medical School, on Tuesday, March 15, at 5:00 p. m.

MASSACHUSETTS MEMORIAL HOSPITALS

There will be a luncheon meeting of the surgical section in the Aid Association Room, Talbot Memorial Building, 82 East Concord Street, Boston, on Friday, March 11, at 12 o'clock noon.

MILO C. GREEN, M.D., *Secretary.*

CAMBRIDGE HOSPITAL

The regular clinicopathological meeting of the staff of the Cambridge Hospital will be held at the hospital, 330 Mt. Auburn Street, Cambridge, on Tuesday, March 15, at 8:30 p. m.

All members of the medical profession are cordially invited to attend.

JOSEPH M. WADDEN, M.D., *Secretary.*

HARVARD MEDICAL SOCIETY

The next meeting of the Harvard Medical Society will be held in the Peter Bent Brigham Hospital amphitheater (Shattuck Street entrance), Tuesday, March 22, at 8:15 p. m.

PROGRAM

Presentation of Cases.
The Pigments and Color of Living Human Skin. Dr. E. A. Edwards and Dr. S. Q. Duntley.

Medical students and physicians are cordially invited to attend.

MARSHALL N. FULTON, M.D., *Secretary.*

BOSTON SOCIETY OF ANESTHETISTS

The next regular meeting of the Boston Society of Anesthetists will be held at the Hotel Kenmore, on Tuesday, March 15, at 7:45 p. m.

Dr. G. Philip Grabfield will speak on "Clinical Thoughts on Pharmacology of Central-Nervous-System Depressants."

LEO V. HAND, M.D., *Secretary.*

BOSTON SOCIETY OF PSYCHIATRY AND NEUROLOGY

The next meeting of the Boston Society of Psychiatry and Neurology will be held at the Boston Medical Library, on Thursday evening, March 17, at 8:15.

PROGRAM

The Pathogenesis of Syphilitic Optic Atrophy. Dr. Samuel H. Epstein.
Psychoanalytic Observations on Two Cases with Preconvulsive Aurae. Dr. Ives Hendrick.
Electrical Signs of Cortical Lesions. Dr. Denis Williams.

H. HOUSTON MERRITT, M.D., *Secretary.*

TUFTS MEDICAL ALUMNI CLUB OF WORCESTER COUNTY

There will be a meeting of the Tufts Medical Alumni Club of Worcester County on Wednesday evening, March 16, at the Bancroft Hotel. Dinner will be served at 6:30; the business meeting will be held at 7:30.

Dr. Abraham Myerson will speak on "Human Autonomic Pharmacology."

C. J. Byrne, M.D., *President,*
N. S. Scarcello, M.D., *Secretary.*

SOCIETY MEETINGS AND CONFERENCES

Calendar of Boston District for the Week Beginning Monday, March 14

Tuesday, March 15

*9-10 a. m. Boston Dispensary. Clinicopathological Conference. Dr. R. C. Wadsworth.

*10 a. m. - 12:30 p. m. Tumor clinic. Boston Dispensary.

*12 m. South End Medical Club. Headquarters of the Boston Tuberculosis Association, 554 Columbus Avenue, Boston.

7:45 p. m. Boston Society of Anesthetists. Hotel Kenmore, Boston.

5 p. m. George W. Gay Lecture on Medical Ethics. Amphitheater E of the Harvard Medical School.

Wednesday, March 16

*9-10 a. m. Boston Dispensary. Hospital case presentation. Dr. S. J. Thannhauser.

*8 p. m. New England Society of Physical Medicine. Hotel Kenmore, Boston.

*12 m. Clinicopathological conference. Children's Hospital Amphitheater.

Thursday, March 17

8:30 9:30 a. m. Exchange visit, surgical and orthopedic staffs of the Peter Bent Brigham and Children's hospitals, held this week at the Children's Hospital.

*9-10 a. m. Boston Dispensary. Allergic Manifestations in Certain Dermatoses: Their Recognition and Treatment. Dr. Francis M. Thurmon.

8:15 p. m. Boston Society of Psychiatry and Neurology. Boston Medical Library, 8 Fenway.

Friday, March 18

*9-10 a. m. Boston Dispensary. Certain Clinical Features of the Natural History of Rheumatic Fever and Heart Disease. Dr. T. Duckett Jones.

*10 a. m. - 12:30 p. m. Tumor clinic. Boston Dispensary.

12 m. Clinical meeting of the Children's Medical Service, Massachusetts General Hospital, Ether Dome.

8 p. m. Sir William Osler Society. Auditorium, Beth Israel Hospital, Boston.

Saturday, March 19

*9-10 a. m. Boston Dispensary. Hospital case presentation. Dr. S. J. Thannhauser.

*10 a. m. - 12 m. Staff rounds at the Peter Bent Brigham Hospital. Conducted by Dr. Henry A. Christian.

Sunday, March 20

4 p. m. Illustrated, public, health lecture, Faulkner Hospital auditorium. Diseases of the Prostate Gland (men only). Dr. Franklin Balch, Jr.

4 p. m. Free public lecture. Harvard Medical School, amphitheater of Building D. The Family Medicine Cabinet. Home Remedies and When to Use Them. Dr. Reginald Fitz.

*Open to the medical profession.

March 10, 11, 12 — New England Hospital Association. Page 51, issue of January 6.

March 11 — Massachusetts Memorial Hospitals. Luncheon meeting of surgical section. Page 450.

March 15 — South End Medical Club, 12 noon at the headquarters of the Boston Tuberculosis Association, 554 Columbus Avenue, Boston.

March 15 — Boston Society of Anesthetists. Page 450.

March 15 — George W. Gay Lecture on Medical Ethics. Page 450.

March 15 — Cambridge Hospital. Clinicopathological meeting of staff. Page 450.

March 16 — Tufts Medical Alumni Club of Worcester County. Notice above.

March 16 — New England Society of Physical Medicine. Page 450.

March 16 — Brookfield Medical Club. Page 406, issue of March 3.

March 17 — Boston Society of Psychiatry and Neurology. Page 450.

March 18 — Sir William Osler Society. Page 450.

March 21 — Boston Medical History Club. 8:15 p. m., Boston Medical Library.

March 22 — Harvard Medical Society. Page 450.

March 28 - April 1 — Postgraduate Institute of the Philadelphia County Medical Society. Page 282, issue of February 10.

April 5 — Greater Boston Medical Society. 8:30 p. m., auditorium of Beth Israel Hospital, Boston.

April 4-8 — The American College of Physicians. Page 41, issue of July 1.

April 14 — Pentucket Association of Physicians. Hotel Bartlett, 95 Main Street, Haverhill, 8:30 p. m.

April 18, 19 and 20 — Thomas William Salmon Memorial Lectures. Page 450.

April 26 — New England Society of Psychiatry. Page 322, issue of February 17.

May 31, June 1 and 2 — Annual meeting of the Massachusetts Medical Society. Hotel Bradford, Boston.

June 13-17 — American Medical Association. San Francisco.

June 13, October 8 and November 15 — American Board of Ophthalmology. Page 282, issue of February 10.

October 17-21 — Clinical Congress of the American College of Surgeons, New York City.

October 24-26 — Academy of Physical Medicine, Scientific Session. Washington, D. C.

District Medical Societies

BRISTOL SOUTH

May 5 — 5 p. m., New Bedford.

ESSEX SOUTH

April 6 — Gloucester Hospital, Gloucester. Clinic at 5 p. m. Dinner at 7 p. m. Speaker and subject to be announced.

May 5 — Censors meet at Salem Hospital, 3:30 p. m.

May 11 — Annual meeting, Salem Country Club, Peabody. Dinner at 7 p. m. Speaker and subject to be announced.

FRANKLIN

Meeting will be held at the Franklin County Hospital, Greenfield at 11 a. m. the second Tuesday of May.

HAMPDEN

Meetings will be held on the fourth Tuesday in April and July.

MIDDLESEX EAST

Meetings will be held at the Bear Hill Golf Club, Stoneham, at 12:15 p. m. on March 16, and May 11.

MIDDLESEX NORTH

Meeting will be held at the Vesper Country Club, Lowell, on April 27.

NORFOLK DISTRICT

March 29 — Hotel Kenmore. 8:15 p. m. Subject to be announced but to be related to diseases of the kidney. Dr. Albert A. Hornor.

May — Annual meeting.

The censors meet on the first Thursdays of May and November in each year.

NORFOLK SOUTH

Meetings held at 12 noon.

April 7 — At the Quincy City Hospital.

May 5 — Annual meeting.

PLYMOUTH

Meetings will be held at 11 a. m. on March 17, April 21, May 19 and July 21.

SUFFOLK

March 15 — Joint meeting with Boston Obstetrical Society. Page 407, issue of March 3.

WORCESTER

April 13 — Hahnemann Hospital, Worcester. Dinner will be at 6:15, to be followed by business session and scientific program.

May 11 — Afternoon and evening, annual meeting. Place and schedule of program to be announced.

BOOK REVIEWS

Quelques Vérités Premières (Ou Soi-Disant Telles) sur Les Maladies Infectieuses. A. Lemierre. 76 pp. Paris: Masson et Cie, 1937. 24 Fr. fr.

This little book is one of a series of nine volumes which are being sponsored by Ombredanne and Fiessinger. The purpose of these books is to have different clinicians who have specialized knowledge of a subject make a se-

ries of general statements concerning different diseases. The present volume contains "vérités premières" about infectious diseases and covers the different types of fever, the septicemias, the exanthems, grippe, erysipelas and angina, with remarks on prophylaxis and therapeutics.

Professor Lemierre has listed the various points as aphorisms and most of the statements are well-recognized facts to all physicians and students of infectious diseases. There are a number of statements which are noteworthy and anyone interested in infectious disorders will find this book of value.

Les Acquisitions Nouvelles de l'Endocrinologie. R. Rivoire. Third edition. 264 pp. Paris: Masson & Cie, 1937. 45 Fr. fr.

This, the third edition of the author's monograph on recent advances in endocrinology, is an exceptionally good survey, for the student or practitioner, of the status of this subject. For the investigator or one about to write upon the subject the book is utterly useless as there is not a single reference to the literature in the whole volume. This glaring fault reduces the value of the book by at least fifty per cent, in spite of the fact that the author has obviously covered the literature very thoroughly, not only in his own language but also in English. The author's views in his preface to this edition strike the keynote to the whole book; he says that "as one will see on reading the book, the hypothetical side has been greatly cut down and it is for the author a great satisfaction to have seen, little by little, physiological, biochemical and clinical researches confirm in great part the theories which he propounded since the beginning of the new era in endocrinology."

Synopsis of Gynecology. Harry Sturgeon Crossen and Robert James Crossen. Second edition. 247 pp. St. Louis: The C. V. Mosby Company, 1937. $3.00.

This *Synopsis of Gynecology* is based on Crossen's *Textbook of Diseases of Women,* one of the well-known standard works. There are twenty chapters, over one hundred illustrations and a good index, in a volume which is compact, handy, and if one knows how to use a synopsis, useful. In general it is well written, and the synoptic presentation is well made and comprehensive.

But this reviewer suggests that a picture of the ovum accompany the description on page 16; that on page 69 respiratory excursion of the abdominal wall be noted; that the resources of abdominal auscultation be not overlooked. The press work is satisfactory, but the type for headings is confusing, as there is lack of uniformity in using larger type for more comprehensive headings.

Bright's Disease and Arterial Hypertension. Willard J. Stone. 352 pp. Philadelphia and London: W. B. Saunders Company, 1936. $5.00.

This is a very well-written and extremely well-illustrated summary of what is generally known concerning the facts and theories of Bright's disease. The initial chapter reviewing historical sequences is of more than passing interest. The succeeding chapters in the first half of the book deal with classification of the disease and a discussion of the various chemical phenomena associated with the diagnosis and study of Bright's disease and its complications. This section of the book is very clearly written, but does contain a certain amount of repetition, especially concerning methods of study which are not in general clinical use. A summary of the methods found clinically useful would be helpful.

The second portion of the book deals with a discussion of the specific forms of Bright's disease, with their diagnosis and treatment, and finally, there is a rather brief discussion of hypertension in its relation to kidney disease. At times the reviewer is somewhat confused over the various clinical subdivisions of the disease and feels that perhaps the matter of classification is a little overemphasized. On the other hand, the consideration of the problem of hypertension is perhaps somewhat inadequate.

In general, the book presents nothing new, but it does present a good, sound summary of what is known about Bright's disease, its diagnosis and treatment.

Rose and Carless Manual of Surgery. Edited by William T. Coughlin. American (fifteenth) edition. 1586 pp. Baltimore: William Wood & Company, 1937. $9.00.

When a work in a period of forty years has reached fifteen English editions and as many re-prints, a number of American editions, and translations in Arabic, Chinese and Hungarian, one is curious to learn the cause of its popularity. The fact that the work covers a very wide field of surgery and is contained in a single volume may appeal to many practitioners and students. As the volume contains about 1600 pages it is necessarily bulky, but its strong binding and calendered paper greatly facilitate its use. The text is clear and concise. The topical arrangement and the employment of heavy-faced type for subheadings make it easily readable. Over 900 well-selected and well-captioned illustrations and an excellent 50-page, double-column index greatly enhance its value as a reference book.

The preface to the English edition states that new chapters on "Surgical Shock" and "Surgery of the Sympathetic Nervous System" have been added and that the chapters on "Thoracic Surgery," "Surgery of the Central Nervous System," and "Anesthesia" have been extensively rewritten. The text under examination is edited by William T. Coughlin from the fifteenth English edition by Wakeley and Hunter. Some parts of the sections relating to the specialties have been omitted. Chapters on the ear, nose, throat, and genitourinary diseases are retained and comprise 125 pages. The chapters on gynecology and tropical surgery have been omitted from the text. References to them have not been deleted from the index, but at the beginning of the index is a statement that "all entries after page 1536 referred to the British edition only."

The work has a British flavor both in phraseology and terminology. Considering its wide scope it is a splendid practical book. A conspicuous feature is the clear description of gross and microscopic anatomy.

Variations in methods of treatment from some of our own are to be expected and are frequently stimulating. There are, however, certain commissions and omissions which seem of sufficient importance to the reviewer to be noted — the sections on fractures of the neck of the femur and pathologic fractures seem inadequate; there is no mention of the Nather-Ochsner operation for subphrenic abscess (page 1145); the tendon suture described is not ideal for hand surgery (page 468); no external part of the sac of a spina bifida should be infolded (page 809); the benefit from Coley toxins cannot be judged in a few days (page 221).

It is a splendid single-volume surgery for the student and practitioner, and its up-to-dateness in certain portions is pleasantly surprising in a work of this scope.